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EDUCATIONAL TIMES.

S & CO.



KEY
TO
LUPTON'S ARITHMETIC

BY
C. R. LUPTON



LONDON
LONGMANS, GREEN, AND CO.
1877

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181. 2. 18*

LONDON : PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET

P R E F A C E.

HAVING USED my father's Arithmetic for some years, I have been requested by several schoolmasters to publish a Key.

Some of the Examples are not worked the shortest way, but in a manner which I trust will be clear to all.

Corrections will be thankfully received by

C. R. LUPTON.

STANSTEAD ST. MARGARETS, HERTS :

November 1877.



100



KEY

TO

ARITHMETIC.

EXERCISE I., p. 10.

sixteen. Three hundred and sixty thousand and
 millions thirteen thousand six hundred and forty-five.
 hundred and forty thousand and five millions seventeen
 four. Four thousand millions seven thousand six
 three. Thirty millions and one. Eight trillions
 forty thousand six hundred and forty billions one
 red millions six hundred and thirty-four thousand
 billions one hundred and five thousand and three.
 us five thousand and three. Six hundred and seven
 five.

; 840020; 10004008; 8000001002; 1102070050;
 400000510; 70103.

EXERCISE II., p. 11.

- | | |
|------------------|------------------|
| (2) 10902590. | (3) 14251814. |
| (5) 18578995. | (6) 154832864. |
| (8) 146071795. | (9) 1788591628. |
| (11) 2569286034. | (12) 2689134309. |

EXERCISE III., p. 12.

- | | |
|--------------------------|---------------------------|
| 1) 12211112. | (2) 2244174440220. |
| 3) 2522848716973. | (4) 93751715310998. |
| 5) 4354973319789. | (6) 418969675560764269. |
| 7) 20432125143859947338. | (8) 60091409370679. |
| 9) 37244818289397. | (10) 8070599951547380. |
| 1) 13949675870177998. | (12) 2801416884358187578. |

EXERCISE IV., p. 12.

- | | |
|------------------------|-----------------------|
| (1) 39898048. | (2) 1637715. |
| (3) 2175139892. | (4) 888888888. |
| (5) 5526950247. | (6) 4024370231295. |
| (7) 419360787288. | (8) 15215907. |
| (9) 1316909736. | (10) 2264188452998. |
| (11) 18006542431134. | (12) 474962963344002. |
| (13) 1702755260372808. | (14) 574504650325. |
| (15) 143161888947. | (16) 536213108705. |
| (17) 7661423925262. | (18) 1781905039614. |
| (19) 22169054828. | (20) 6119338474170. |

EXERCISE V., p. 13.

- | | | |
|-------------------|----------------|-------------------|
| (1) 44679128. | (2) 312747928. | (3) 36194372. |
| (4) 5975047-4. | (5) 497651-5. | (6) 283572101-4. |
| (7) 7254200-31. | (8) 132694-19. | (9) 1310782-55. |
| (10) 98117142-25. | (11) 551784-9. | (12) 64546918-47. |
| (13) 925671. | (14) 523475. | (15) 789648. |
| (16) 24561. | (17) 956475. | (18) 1794353. |
| (19) 8297561. | (20) 42587532. | |

EXERCISE VI., p. 15.

- | | |
|----------------------|---------------------|
| (1) 1808 farthings. | (2) 8561 halfpence. |
| (3) 35519 farthings. | (4) 1260000 pence. |
| (5) £1787 16s. 9d. | (6) 78651 guineas. |
-
- | | |
|----------------------------|-----------------|
| 20 | 21 |
| 35756s. | 78651 |
| 4 | 157302 |
| 143027 three-penny pieces. | 1651671s. |
| | 12 |
| | 19820052d. |
| | 2 |
| | 39640104 hl. d. |
-
- | | |
|--------------------------|-------------------------|
| (7) 545593515 farthings. | (8) 22518480 farthings. |
|--------------------------|-------------------------|

- (9) £7385924 10s. 8d.

20
147718490s.
3
443155472 four-penny pieces.

- 0) 480000018 farthings. (11) 12384200 pence.
 2) 7844 drams. (13) 14366 drams.
 4) 3680659 drams. (15) 37529 ounces.
 6) 72805374 drams.

$$\begin{array}{r}
 (17) \quad 8765963 \text{ tons } 10 \text{ cwt. } 3 \text{ qrs. } 20 \text{ lbs. } 14 \text{ oz.} \\
 \underline{20} \\
 175319270 \text{ cwt.} \\
 \underline{4} \\
 701277083 \text{ qrs.} \\
 \underline{28} \\
 5610216684 \\
 1402554166 \\
 19635758344 \text{ lbs.} \\
 \underline{16} \\
 117814650078 \\
 19635758344 \\
 314172133518 \text{ oz.}
 \end{array}$$

- 8) 10052 grains. (19) 32413 grains.

$$\begin{array}{r}
 (20) \quad 175863425 \text{ lbs. } 10 \text{ oz. } 15 \text{ dwts. } 20 \text{ grs.} \\
 \underline{12} \\
 2110361110 \text{ oz.} \\
 \underline{20} \\
 42207222215 \text{ dwts.} \\
 \underline{24} \\
 168828888880 \\
 84414444430 \\
 1012973333180 \text{ grs.}
 \end{array}$$

- 1) 135983 grains. (22) 210933 grains. (23) 30339716 grains.

- 4) 1068574 lbs. 10 oz. 5 drs. 2 scr. 16 grs.

$$\begin{array}{r}
 \underline{12} \\
 12822898 \text{ oz.} \\
 \underline{8} \\
 102583189 \text{ drs.} \\
 \underline{3} \\
 307749569 \text{ scr.} \\
 \underline{20} \\
 6154991396 \text{ grs.}
 \end{array}$$

$$\begin{array}{r}
 (25) \quad 1 \text{ ml. } 4 \text{ fur. } 110 \text{ yds. } 2 \text{ ft.} \\
 \underline{8} \\
 12 \text{ fur.} \\
 \underline{220} \\
 350 \\
 \underline{24} \\
 2750 \text{ yds.} \\
 \underline{3} \\
 8252 \text{ ft.}
 \end{array}$$

(26) 25 mls. 3 fur. 100 yds. 2 ft. 6 in.

8

203 fur.

220

4160

406

44760 yds.

3

134282 ft.

12

1611390 in.

(27) 17685432 mls. 3 fur. 20 pls. 3 yds. 1 i

8

141483459 fur.

40

5659338380 pls.

5½

28296691903

2629669190

31126361093 yds.

3

93379083280 ft.

(28) 8 sq. mls. 15A. 3R. 8P. 6 yds. 8 ft.

640

5135A.

4

20543R.

40

821728P.

30½

24651846

205432

24857278 yds.

9

223715510 ft.

(29) 176458A. 1R. 20P. 20 yds. 6

4

705833R.

40

28233340P.

30½

847000220

7058335

854058555 yds.

9

7686527001 ft.

(30) 575 pints.

(31) 2279 pints.

REDUCTION.

5

(32) 468759 lds. 4 qrs. 6 bus. 2 pks. 1 gal. 2 qts. 1 pt.

$$\begin{array}{r}
 5 \\
 \hline
 2343799 \text{ qrs.} \\
 8 \\
 \hline
 18750398 \text{ bus.} \\
 4 \\
 \hline
 75001594 \text{ pks.} \\
 2 \\
 \hline
 150003189 \text{ gals.} \\
 4 \\
 \hline
 600012758 \text{ qts.} \\
 2 \\
 \hline
 1200025517 \text{ pts.}
 \end{array}$$

(33) 259400 cubic inches.

(34) 2505610 cubic inches.

35) 73 yds. 3 qrs. 1 nl. $1\frac{1}{2}$ in.

$$\begin{array}{r}
 4 \\
 \hline
 295 \text{ qrs.} \\
 4 \\
 \hline
 1181 \text{ nls.} \\
 2\frac{1}{2} \\
 \hline
 2363\frac{1}{2} \\
 295\frac{1}{2} \\
 \hline
 2659 \text{ in.}
 \end{array}$$

(36) 854 yds. 2 qrs. 1 nl. $1\frac{1}{2}$ in.

$$\begin{array}{r}
 4 \\
 \hline
 3418 \text{ qrs.} \\
 4 \\
 \hline
 13673 \text{ nls.} \\
 2\frac{1}{2} \\
 \hline
 27347\frac{1}{2} \\
 3418\frac{1}{2} \\
 \hline
 30766 \text{ in.}
 \end{array}$$

(37) 96543 yds. 1 qr. 0 nls. 2 in.

$$\begin{array}{r}
 4 \\
 \hline
 386173 \text{ qrs.} \\
 4 \\
 \hline
 1544692 \text{ nls.} \\
 2\frac{1}{2} \\
 \hline
 3089386 \\
 386173 \\
 \hline
 3475559 \text{ in.}
 \end{array}$$

(38) 271732 seconds.

(39) 410520 hours.

KEY TO ARITHMETIC.

(40) 3695827 yrs. 6 mo. 3 wks. 6 dys. 0 min. 16 sec.

12

44349930 mo.

4

177399723 wks.

7

1241798067 dys.

24

4967192268

2483596134

29803153608 hrs.

60

1788189216480 min.

60

107291352988816 sec.

EXERCISE VII., p. 16.

(1) £60 0s. 10 $\frac{3}{4}$ d.

(2) £9003 7s. 0½d.

(3) 15545 half-crowns, 7½d.

(4) 1850 gs. 13s. 3½d.

(5) £7140 5s. 10½d.

(6) £183905171 4s. 4d.

(7) £296914179 13s. 10d.

(8) £625000006 5s.

(9) 6899487843 grs. 2s. 6 $\frac{1}{2}$ d.

(10) 167603265 gs. 3s. 1d.

(11) 1416309581 grs. 4s. 0 $\frac{1}{2}$ d.

(12) £3806644695 9s. 2½d.

(13) £3929863860 6s. 9d.

(14) 2) 6843219004932 sixpences.

$$21 = 3 \times 7 \left\{ \begin{array}{r} 3) \overline{3421609502466} \\ 7) \overline{1140536500822.0} \end{array} \right\} 15s. \\ \underline{162933785831.5} \\ 162933785831 \text{ grs. } 15s.$$

(15) 4) 453279634987 farthings.

12) 113319908746 . 1d.

7) 9443325728 . 10d.

£1349046532 . 4s. 10³d.

$$\begin{array}{r}
 (16) \quad 4) 3749378963 \text{ farthings.} \\
 3,0) \underline{93734474,0} . \frac{3}{4}d. \\
 31244824 . 20\frac{1}{4}d. \\
 31244824 \text{ hl. crowns } 1s. 8\frac{1}{4}d.
 \end{array}$$

$$(17) \quad 3287502 \text{ crowns.}$$

$$(18) \quad 3649128 \text{ crowns } 1s. 2\frac{1}{4}d.$$

$$(19) \quad 55655\frac{1}{4} \text{ cwt. } 1 \text{ qr. } 10 \text{ lbs. } 11 \text{ oz.}$$

$$\begin{array}{r}
 (20) \quad 16 = 4 \times 4 \left\{ \begin{array}{l} 4) \underline{435679835900001} \text{ drams.} \\ 4) \underline{108919958975001} . 1 \end{array} \right\} 1 \text{ dr.} \\
 16 = 4 \times 4 \left\{ \begin{array}{l} 4) \underline{27229989743750} . 0 \\ 4) \underline{6807497435937} . 2 \end{array} \right\} 6 \text{ oz.} \\
 28 = 7 \times 4 \left\{ \begin{array}{l} 4) \underline{1701874358984} . 1 \\ 7) \underline{425468589746} . 0 \\ 4) \underline{60781227106} . 4 \end{array} \right\} 16 \text{ lbs.} \\
 2,0) \underline{1519530677,6} . 2 \text{ qrs.} \\
 759765338 \text{ tons } 16 \text{ cwt. } 2 \text{ qrs. } 16 \text{ lbs. } 6 \text{ oz. } 1 \text{ dr.}
 \end{array}$$

$$(21) \quad 165174 \text{ cwt. } 3 \text{ qrs. } 14 \text{ lbs. } 15 \text{ oz. } 11 \text{ drs.}$$

$$(22) \quad 551146 \text{ tons } 7 \text{ cwt. } 2 \text{ qrs. } 10 \text{ lbs.}$$

$$(23) \quad 12745 \text{ tons } 5 \text{ cwt. } 0 \text{ qrs. } 7 \text{ lbs. } 4 \text{ oz.}$$

$$(24) \quad 13329 \text{ tons } 14 \text{ cwt. } 2 \text{ qrs. } 10 \text{ lbs. } 4 \text{ oz. } 15 \text{ drs.}$$

$$(25) \quad 1029428 \text{ qrs. } 12 \text{ lbs. } 14 \text{ oz. } 10 \text{ drs.}$$

$$\begin{array}{r}
 (26) \quad 2,0) \underline{1257098640370012,9} \text{ grs.} \\
 3) \underline{628549320185006} . 9 \text{ grs.} \\
 8) \underline{209516440061668} . 2 \text{ scr.} \\
 12) \underline{26189555007708} . 4 \text{ drs.} \\
 2182462917309 \text{ lbs. } 0 \text{ oz. } 4 \text{ drs. } 2 \text{ scr. } 9 \text{ grs.}
 \end{array}$$

$$(27) \quad 1462376 \text{ lbs. } 8 \text{ oz. } 19 \text{ dwts. } 1 \text{ gr.}$$

$$(28) \quad 159464977 \text{ oz. } 1 \text{ dwt. } 17 \text{ grs.}$$

$$\begin{array}{r}
 (29) \quad 24 = 6 \times 4 \left\{ \begin{array}{l} 4) \underline{768426849672} \text{ grs.} \\ 6) \underline{192106712418} \\ 2,0) \underline{3201778540,3} \\ 12) \underline{1600889270} . 3 \text{ dwts.} \end{array} \right\} \\
 133407439 \text{ lbs. } 2 \text{ oz. } 3 \text{ dwts.}
 \end{array}$$

KEY TO ARITHMETIC.

(30)

$$\begin{array}{r}
 12) 3751395761 \text{ in.} \\
 3) 312616313 \text{ . 5 in.} \\
 \hline
 104205438 \text{ . 2 ft.} \\
 \hline
 2 \\
 11) 208410874 \qquad \qquad \text{yd. ft. in.} \\
 \hline
 4,0) 1894644,3 \text{ . 1 hl. yd.} = 0 \text{ } 1 \text{ } 6 \\
 \hline
 \qquad \qquad \qquad 1 \text{ } 0 \text{ } 11 \\
 473661 \text{ fur. 3 pls. 1 yd. 0 ft. 11 in.}
 \end{array}$$

(31)

$$\begin{array}{r}
 12) 3401607326 \text{ in.} \\
 3) 283467277 \text{ . 2 in.} \\
 \hline
 94489092 \text{ . 1 ft.} \\
 \hline
 2 \\
 11) 188978184 \\
 \hline
 4,0) 1717983,4 \text{ . 10 hl. yds.} = 5 \text{ yds.} \\
 \hline
 8) 429495 \text{ . 34 pls.} \\
 \hline
 53686 \text{ mls. 7 fur. 34 pls. 5 yds. 1 ft. 2 in.}
 \end{array}$$

(32)

$$\begin{array}{r}
 12) 468924790 \text{ in.} \\
 3) 39077065 \text{ . 10 in.} \\
 \hline
 13025688 \text{ . 1 ft.} \\
 \hline
 2 \\
 11) 26051376 \\
 \hline
 4,0) 236830,6 \text{ . 10 hl. yds.} = 5 \text{ yds.} \\
 \hline
 8) 59207 \text{ . 26 pls.} \\
 \hline
 7400 \text{ mls. 7 fur. 26 pls. 5 yds. 1 ft. 10 in.}
 \end{array}$$

(33)

$$\begin{array}{r}
 3) 4983257842 \text{ ft.} \\
 \hline
 1661085947 \text{ . 1 ft.} \\
 \hline
 2 \\
 11) 3322171894 \\
 \hline
 4,0) 30201562,6 \text{ . 8 hl. yds.} = 4 \text{ yds.} \\
 \hline
 8) 7550390 \text{ . 26 pls.} \\
 \hline
 3) 943798 \text{ . 6 fur.} \\
 \hline
 314599 \text{ leagues 1 ml. 6 fur. 26 pls. 4 yds. 1 ft.}
 \end{array}$$

$$1) \quad 144 = 12 \times 12 \left\{ \begin{array}{l} \text{12) } 41601764824 \text{ sq. in.} \\ \text{12) } 3466813693 \text{ . 8} \\ \text{9) } 288901141 \text{ . 1} \end{array} \right\} 20 \text{ sq. in.}$$

$$\quad \quad \quad 32100126 \text{ . 7 sq. ft.}$$

$$\quad \quad \quad 4$$

$$121 = 11 \times 11 \left\{ \begin{array}{l} \text{11) } 128400504 \\ \text{11) } 11672773 \text{ . 1} \\ \text{4,0) } 106116,1 \text{ . 2} \end{array} \right\} 23 \text{ fourth-yds.} = \begin{array}{r} \text{yds. ft. in.} \\ 0 \quad 7 \quad 20 \\ 5 \quad 6 \quad 108 \\ 6 \quad 4 \quad 128 \end{array}$$

$$\quad \quad \quad 4) 26529 \text{ . 1 fur.}$$

$$\quad \quad \quad 6632A. 1R. 1 \text{ fur. } 6 \text{ yds. } 4 \text{ ft. } 128 \text{ in.}$$

$$5) \quad 153142300 \text{ sq. yds.}$$

$$\quad \quad \quad 4$$

$$121 = 11 \times 11 \left\{ \begin{array}{l} \text{11) } 612569200 \\ \text{11) } 55688109 \text{ . 1} \\ \text{4,0) } 506255,5 \text{ . 4} \end{array} \right\} 45 \text{ fourth-yds.} = 11\frac{1}{4} \text{ yds.}$$

$$\quad \quad \quad 4) 126563 \text{ . 35P.}$$

$$\quad \quad \quad 31640A. 3 \text{ fur. } 35P. 11\frac{1}{4} \text{ yds.}$$

$$1) \quad 144 = 12 \times 12 \left\{ \begin{array}{l} \text{12) } 9760005473 \text{ sq. in.} \\ \text{12) } 813333789 \text{ . 5} \\ \text{9) } 67777815 \text{ . 9} \end{array} \right\} 113 \text{ sq. in.}$$

$$\quad \quad \quad 7530868 \text{ . 3 ft.}$$

$$\quad \quad \quad 4$$

$$121 = 11 \times 11 \left\{ \begin{array}{l} \text{11) } 30123472 \\ \text{11) } 2738497 \text{ . 5} \\ \text{4,0) } 24895,4 \text{ . 3} \end{array} \right\} 38 \text{ fourth-yds.} = \begin{array}{r} \text{yds. ft. in.} \\ 0 \quad 3 \quad 113 \\ 9 \quad 4 \quad 72 \\ 9 \quad 8 \quad 41 \end{array}$$

$$\quad \quad \quad 4) 6223 \text{ . 34P.}$$

$$\quad \quad \quad 1555A. 3R. 34P. 9 \text{ yds. } 8 \text{ ft. } 41 \text{ in.}$$

(37) 40028846 lds. 2 qrs. 5 bus. 1 pk. 1 gal. 3 qts.

(38) 4 yrs. 3 mo. 0 wks. 0 dys. 21 hrs. 33 min. 9 sec.

(39) 501 yrs. 10 mo. 2 wks. 1 dy. 23 hrs. 7 min. 4 sec.

- (40) $6,0) 96548350146,8 \text{ sec.}$
 $6,0) 1609139169,1 \text{ . 8 sec.}$
 $24 = 4 \times 6 \left\{ \begin{array}{l} 4) 268189861 \text{ . 31 min.} \\ 6) 67047465 \text{ . 1} \\ 7) 11174577 \text{ . 3} \end{array} \right\} 13 \text{ hrs.}$
 $4) 1596368 \text{ . 1 dy.}$
 $12) 399092 \text{ . 0 wks.}$
 $33257 \text{ yrs. 8 mo. 0 wks. 1 dy. 13 hrs. 31 min. 8 sec.}$

EXERCISE VIII., p. 17.

- | | |
|--|---------------------------------------|
| (1) £542 2s. 7½d. | (2) £1334 7s. 5½d. |
| (3) £1064 17s. 4½d. | (4) £6759 17s. 3½d. |
| (5) £2466 3s. 4½d. | (6) £112590 18s. 1½d. |
| (7) £116862 18s. 7d. | (8) £89951 3s. 7d. |
| (9) £11065 11s. 8d. | (10) £13066 16s. 1d. |
| (11) £140677 19s. 8½d. | (12) £143240 4s. 11½d. |
| (13) £899997 1s. 1½d. | (14) £2826612 15s. 9½d. |
| (15) £2469061 5s. 3d. | (16) £3665984 9s. 3d. |
| (17) 39 tons 11 cwt. 2 qrs. 3 lbs. 4 oz. 15 drs. | |
| (18) 42 tons 9 cwt. 0 qrs. 8 lbs. 15 oz. 14 drs. | |
| (19) 35 tons 14 cwt. 3 qrs. 17 lbs. 2 oz. 8 drs. | |
| (20) 48 oz. 3 dwts. 10 grs. | (21) 5 lbs. 6 oz. 3 dwts. 13 grs. |
| (22) 38 oz. 18 dwts. 19 grs. | (23) 47 drs. 0 scr. 16 grs. |
| (24) 5 oz. 3 drs. 0 scr. 1 gr. | (25) 4 oz. 7 drs. 0 scr. 8 grs. |
| (26) 21 qts. 1 pt. 3 gills. | (27) 24 qts. 0 pts. 2 gills. |
| (28) 29 qts. 1 pt. 2 gills. | (29) 112 hrs. 3 min. 5 sec. |
| (30) 97 hrs. 41 min. 58 sec. | (31) 51 hrs. 0 min. 5 sec. |
| (32) 137P. 3 yds. 1 ft. 8 in. | (33) 97 mls. 0 fur. 35P. 4 yds. 1 ft. |
| (34) 28 fur. 25 yds. 0 ft. 3 in. | (35) 54 ells 0 qrs. 2 nls. 1½ in. |
| (36) 111 yds. 2 qrs. 3 nls. ¼ in. | (37) 171 ells 3 qrs. 0 nls. ¼ in. |
| (38) 771 mls. 488A. 0R. 0P. | (39) 198 mls. 609A. 1278 yds. 6 ft. |
| (40) 2446A. 2513 yds. 8 ft. 4 in. | |

EXERCISE IX., p. 20.

- | | | |
|---------------------|--------------------|----------------------|
| (1) £23 1s. 9d. | (2) £1 3s. 10d. | (3) £6 9s. 0¾d. |
| (4) £7 16s. 1½d. | (5) £8 11s. 8½d. | (6) £19 18s. 11½d. |
| (7) £28 1s. 1½d. | (8) £35 19s. 0½d. | (9) £67 14s. 6¾d. |
| (10) £84 12s. 0½d. | (11) £89 9s. 0¾d. | (12) £100 1s. 7½d. |
| (13) £200 17s. 8½d. | (14) £500 9s. 0¾d. | (15) £896 18s. 10¾d. |

960 Os. 9½d. (17) £14188 18s. 10½d. (18) £8880 18s. 1½d.
 7320 15s. 5d. (20) £97854 18s. 7½d. (21) 1 lb. 10 oz. 13 drs.
 r. 0 lbs. 10 oz. 14 drs. (23) 4 lbs. 11 oz. 10 drs.
 z. 6 dwts. 9 grs. (25) 3 oz. 1 dwt. 18 grs.
 bs. 5 oz. 18 dwts. 23 grs. (27) 0 oz. 1 dr. 1 scr. 18 grs.
 z. 2 drs. 0 scr. 8 grs. (29) 6 oz. 1 dr. 1 scr.
 ds. 0 ft. 2 in. (31) 10 miles 0 fur. 8p.
 miles 3 fur. 38p. (33) 2 yds. 0 qrs. 2 nls.
 ds. 2 qrs. 3 nls. (35) 9 yds. 1 qr. 2 nls.
 a. 0r. 18p. (37) 43a. 1r. 36p.
 . 0r. 30p. (39) 5 qrs. 3 bus. 2 pks.
 us. 0 pks. 0 gals. 2 qts. (41) 0 gals. 2 qts. 0 pts. 1 gill.
 hrs. 10 min. 48 sec.
 on 15 cwt. 2 qrs. 26 lbs. 9 oz. 15 drs.
 b. 9 oz. 15 dwts. 22 grs. (45) 2 lbs. 5 oz. 5 drs. 2 scr. 16 grs.
 nl. 1 fur. 36p. 0 yds. 2 ft. 9 in.
 ds. 3 qrs. 5 bus. 2 pks. 1 gal. 3 qts. 0 pts.
 . 2r. 35p. 3 sq. yds. 8 ft. 127 in.
 rs. 10 mo. 2 wks. 3 dys. 19 hrs. 55 min. 19 sec.
 ub. yd. 22 ft. 1879 in.

EXERCISE X., p. 23.

2 4s. 6d. (2) £117 1s. 0d. (3) £148 15s. 9½d.
 33 16s. 5½d. (5) £431 15s. 6d. (6) £631 4s. 4d.
 488 17s. 4¾d. (8) £2869 0s. 10d. (9) £3857 12s. 10½d.
 737 5s. 9d. (11) £7251 11s. 4¾d. (12) £7537 12s. 7d.
 681 0s. 4d. (14) £22046 12s. 8d. (15) £19577 8s. 11¼d.
 8594 11s. 10½d. (17) £17777 14s. 9½d. (18) £47579 7s. 6d.
 4931 19s. 5½d. (20) £64728 2s. 6d. (21) £81299 4s. 9d.
 06533 5s. 0d. (23) £871 17s. 6d. (24) £1674 8s. 1½d.
 949 18s. 6d. (26) £3667 11s. 6d. (27) £5051 17s. 9d.
 912 5s. 0d. (29) £2300 18s. 6d. (30) £9652 6s. 0d.
 022 10s. 0d. (32) £5456 14s. 0d. (33) £7745 12s. 1d.
 1196 10s. 0d. (35) £15925 4s. 0d. (36) £24102 10s. 0d.

EXERCISE XI., p. 23.

6082 0s. 7½d. (2) £1262 6s. 8d. (3) £3053 9s. 2d.
 049 13s. 9d. (5) £10338 13s. 4d. (6) £17211 11s. 0½d.
 9 14s. 8d. (8) £1938 13s. 2½d. (9) £231 19s. 4¾d.
 799 13s. 9¾d. (11) £3019 15s. 6¾d. (12) £1564 13s. 1½d.
 63008 19s. 0¾d. (14) £65 7s. 9¾d. (15) £7448 14s. 7¾d.
 694 10s. 6d. (17) £139 3s. 1½d. (18) £914 17s. 5½d.

EXERCISE XII., p. 24.

$$\begin{array}{r}
 \text{(1)} \quad \begin{array}{r} \text{lbs.} \quad \text{os.} \quad \text{dwts.} \quad \text{grs.} \times 83 \\ 18 \quad 6 \quad 16 \quad 8 \times 2 \\ \hline 9 \\ 167 \quad 1 \quad 7 \quad 0 \\ \hline 9 \\ 1604 \quad 0 \quad 3 \quad 0 \\ 37 \quad 1 \quad 12 \quad 16 \end{array} \left. \vphantom{\begin{array}{r} 1604 \\ 37 \end{array}} \right\} \text{Add} \\
 \hline
 1641 \quad 1 \quad 15 \quad 16
 \end{array}$$

$$\begin{array}{r}
 \text{(2)} \quad \begin{array}{r} \text{lbs.} \quad \text{os.} \quad \text{dwts.} \quad \text{grs.} \times 164 \\ 64 \quad 6 \quad 10 \quad 16 \times 4 \\ \hline 10 \\ 645 \quad 5 \quad 6 \quad 16 \times 6 \\ \hline 10 \\ 6454 \quad 5 \quad 6 \quad 16 \\ 3872 \quad 8 \quad 0 \quad 0 \\ 258 \quad 2 \quad 2 \quad 16 \end{array} \left. \vphantom{\begin{array}{r} 6454 \\ 3872 \\ 258 \end{array}} \right\} \text{Add} \\
 \hline
 10585 \quad 3 \quad 9 \quad 8
 \end{array}$$

$$\begin{array}{r}
 \text{(3)} \quad \begin{array}{r} \text{lbs.} \quad \text{os.} \quad \text{dwts.} \quad \text{grs.} \times 256 \\ 2 \quad 2 \quad 2 \quad 2 \\ \hline 8 \\ 17 \quad 4 \quad 16 \quad 16 \\ \hline 8 \\ 189 \quad 2 \quad 13 \quad 8 \\ \hline 4 \\ 556 \quad 10 \quad 18 \quad 8 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(4)} \quad \begin{array}{r} \text{lbs.} \quad \text{os.} \quad \text{dwts.} \quad \text{scr.} \quad \text{grs.} \times 288 \\ 24 \quad 2 \quad 2 \quad 1 \quad 10 \\ \hline 4 \\ 96 \quad 9 \quad 2 \quad 0 \quad 0 \\ \hline 6 \\ 580 \quad 7 \quad 4 \quad 0 \quad 0 \\ \hline 12 \\ 6967 \quad 6 \quad 0 \quad 0 \quad 0 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(5)} \quad \begin{array}{r} \text{os.} \quad \text{dwts.} \quad \text{scr.} \quad \text{grs.} \times 79 \\ 2 \quad 4 \quad 2 \quad 4 \times 2 \\ \hline 7 \\ 1 \quad 6 \quad 1 \quad 0 \quad 8 \\ \hline 11 \\ 16 \quad 7 \quad 4 \quad 1 \quad 8 \\ 5 \quad 1 \quad 1 \quad 8 \end{array} \left. \vphantom{\begin{array}{r} 16 \\ 5 \end{array}} \right\} \text{Add} \\
 \hline
 17 \quad 0 \quad 5 \quad 2 \quad 16
 \end{array}$$

$$\begin{array}{r}
 \text{(6)} \quad \begin{array}{r} \text{lbs.} \quad \text{os.} \quad \text{dwts.} \quad \text{scr.} \times 243 \\ 2 \quad 2 \quad 2 \quad 2 \\ \hline 3 \\ 6 \quad 7 \quad 0 \quad 0 \\ \hline 9 \\ 59 \quad 3 \quad 0 \quad 0 \\ \hline 9 \\ 533 \quad 3 \quad 0 \quad 0 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(7)} \quad \begin{array}{r} \text{yds.} \quad \text{qrs.} \quad \text{nls.} \times 216 \\ 21 \quad 2 \quad 2 \\ \hline 3 \\ 64 \quad 3 \quad 2 \\ \hline 12 \\ 778 \quad 2 \quad 0 \\ \hline 6 \\ 4671 \quad 0 \quad 0 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(8)} \quad \begin{array}{r} \text{ells} \quad \text{qrs.} \quad \text{nls.} \quad \text{in.} \times 85 \\ 6 \quad 2 \quad 1 \quad 1 \times 5 \\ \hline 10 \\ 64 \quad 3 \quad 2 \quad 1 \\ \hline 8 \\ 517 \quad 3 \quad 3 \quad 1\frac{1}{2} \\ 32 \quad 1 \quad 3 \quad 0\frac{1}{2} \end{array} \left. \vphantom{\begin{array}{r} 517 \\ 32 \end{array}} \right\} \text{Add} \\
 \hline
 550 \quad 0 \quad 2 \quad 1\frac{1}{2}
 \end{array}$$

i) yds. qrs. nls. in. $\times 169$
 2 3 3 $1\frac{1}{2} \times 9$
 10
 29 3 0 $1\frac{1}{2} \times 6$
 10
 297 3 2 $1\frac{1}{2}$
 26 3 1 0 } Add
 178 3 0 0
 503 1 3 $1\frac{1}{2}$

(10) yrs.* mo. wks. dys. $\times 73$
 3 11 2 6×1
 6
 23 5 1 1
 12
 280 11 1 5 } Add
 3 11 2 6
 284 10 0 4

) mo.* wks. dys. hrs. $\times 245$
 7 1 3 12
 5
 2 10 3 3 12
 7
 19 11 0 3 12
 7
 138 12 3 3 12

(12) wks.* dys. hrs. min. $\times 168$
 2 6 5 40
 3
 2 0 4 17 0
 7
 1 1 4 4 23 0
 8
 9 4 1 4 16 0

i) tons cwt. qrs. lbs. $\times 786$
 5 4 3 4×6
 12
 62 17 1 20
 11
 691 11 2 24
 6
 4149 10 1 4 } Subtr.
 31 8 2 24
 4118 1 2 8

(14) cwt. qrs. lbs. oz. $\times 247$
 3 2 14 6×3
 10
 1 16 1 3 12
 5
 9 1 1 18 12
 5
 45 7 0 9 12 } Subtr.
 10 3 15 2
 44 16 0 22 10

i) qrs. lbs. oz. drs. $\times 162$
 3 14 8 8
 2
 1 3 1 1 0
 9
 15 3 9 9 0
 9
 2 2 2 1 0

(16) gals. qts. pts. gills $\times 473$
 3 3 1 3×7
 12
 47 2 1 0
 10
 476 1 0 0
 4
 1905 0 0 0 } Subtr.
 27 3 0 1
 1877 0 1 3

* In this example 12 months = 1 year.

(17)	lds. qrs. bus. pks. $\times 285$	(18)	qrs. bus. pks. gals. $\times 288$
	3 4 7 3×3		4 3 2 1
	12		4
	<hr/>		<hr/>
	47 4 5 0		17 6 2 0
	12		6
	<hr/>		<hr/>
	575 0 4 0		106 7 0 0
	2		12
	<hr/>		<hr/>
	1150 1 0 0		1282 4 0 0
	11 4 7 1		
	} Subtr.		
	<hr/>		
	1138 1 0 3		

(19)	c.yds. ft. in. $\times 897$	(20)	c.yds. ft. in. $\times 774$
	122 13 1191 $\times 3$		21 13 508 $\times 4$
	10		10
	<hr/>		<hr/>
	1225 1 1542		214 24 1624
	10		11
	<hr/>		<hr/>
	12250 18 1596		2364 4 584
	9		7
	<hr/>		<hr/>
	110256 8 540		16549 3 632
	367 14 117		85 26 304
	} Subtr.		} Add
	<hr/>		<hr/>
	109888 21 423		16635 2 936

(21)	c.yds. ft. in. $\times 770$	(22)	mls. fur. pls. yds. $\times 876$
	14 13 12		4 5 33 1
	11		12
	<hr/>		<hr/>
	159 8 132		56 5 38 1
	7		9
	<hr/>		<hr/>
	1115 2 924		510 5 23 $3\frac{1}{2}$
	10		8
	<hr/>		<hr/>
	11150 25 600		4085 4 29 $0\frac{1}{2}$
			56 5 38 1
			} Add
			ft. in.
			<hr/>
			4142 2 27 1 1 6

(23)

fur.	pls.	yds.	ft.	in.		
7	39	2	1	×	4	
					9	
8	7	34	4 $\frac{1}{2}$	0		
					10	
89	6	28	1	0		
					11	
988	1	30	0	0	} Add	
3	7	37	3 $\frac{1}{2}$	1		in.
992	1	27	3	2	6	

(24)

pls.	yds.	ft.	in.	
37	4	2	10	
				5
4	29	2	2	2
				5
2	7	27	2	10
				5
14	6	17	2	0
				2

(25)

sq. yds.	ft.	in.	
20	4	36	×
			7
			6
4	1	7	72
			6
24	11	0	0
			10
1	2	3	19 $\frac{1}{4}$
			0
4	22	2	108
			0
1	2	8	11
			2
			108

(26)

R.	pls.	yds.	
3	39	3	×
			9
		5	
4	3	35	15
			9
44	2	39	14
			10
447	1	34	19
			0
8	3	31	27
			0
456	1	26	15 $\frac{1}{2}$

(27)

A.	R.	P.	
4	2	20	×
			7
		10	
46	1	0	
		10	
462	2	0	
		10	
4625	0	0	
		5	
23125	0	0	} Add
32	1	20	
23157	1	20	

EXERCISE XIII, p. 24.

- (1) £16 18s. 9d. (2) £1680100 19s. 11d. (3) £176 8s. 11d.
 (4) £186 3s. 3 $\frac{1}{2}$ d. (5) £117 8s. 6 $\frac{1}{2}$ d. (6) £3 12s. 11d.

- (7) £630 18s. 3½d. (8) £558 18s. 8½d. (9) £7 15s. 9½d.
 (10) £7 1s. 1d. (11) £3 14s. 9d. (12) £6 8s. 4d.
 (13) £24 9s. 0½d. (14) £2 19s. 9½d. (15) £454 10s. 5½d.
 (16) £779 19s. 1¾d. (17) £4 16s. 9d. (18) £8 7s. 0d.
 (19) £10 4s. 7d. (20) £8 5s. 1d. (21) £5 11s. 3d.
 (22) £1280 15s. 3d. (23) £4 4s. 7d. (24) £2 18s. 9½d.
 (25) £36 0s. 1¾d. (26) £40 18s. 3d. (27) £57 6s. 2¼d.
 (28) £78 9s. 9½d. (29) £40 16s. 6d. (30) £70 10s. 6½d.
 (31) £3 2s. 6½d. (32) £10 3s. 6½d. (33) £40 10s. 9½d.
 (34) £60 10s. 6d. (35) £100 14s. 6d. (36) £500 16s. 6½d.
 (37) £1 6s. 6½d. (38) £2 10s. 2½d. (39) £5 12s. 8d.
 (40) £20 10s. 6d. (41) £329 0s. 2d. (42) £33 12s. 0½d.
 (43) £1299 1s. 3d. (44) £100 11s. 11¼d. (45) £753 3s. 2d.
 (46) £14 2s. 1¾d.

EXERCISE XIV., p. 25.

- (1) 9 lbs. 11 oz. 5 dwts. (2) 17 lbs. 2 oz. 19 dwts.
 (3) 3 tons 13 cwt. 1 qr. 4 lbs. (4) 7 tons 19 cwt. 3 qrs. 27 lbs.
 (5) 12 lbs. 7 oz. 5 drs. 2 scr. (6) 5 lbs. 2 oz. 7 drs. 2 scr.
- (7)

	ms.	fur.	pls.
16 = 4 × 4	(4) 92	3	8 + 16
	(4) 23	0	32
	5	6	8
- (8)

	yds.	ft.	in.
21 = 7 × 3	(3) 163	2	9 + 21
	(7) 54	1	11
	7	2	5
- (9)

	A.	R.	P.
28 = 4 × 7	(4) 611	2	20 + 28
	(7) 152	3	25
	21	3	15
- (10)

	A.	R.	P.
54 = 6 × 9	(6) 195	1	26 + 54
	(9) 32	2	11
	3	2	19
- (11)

	yds.	qrs.	nl.
96 = 8 × 12	(8) 462	0	0 + 96
	(12) 57	3	0
	4	3	1
- (12)

	c. yds.	c. ft.	c. in.
100 = 10 × 10	(10) 329	26	1648 + 100
	(10) 32	26	1710
	3	8	171
- (13)

	bus.	pks.	gals.	qts.
120 = 10 × 12	(10) 352	2	0	0 + 120
	(12) 35	1	0	0
	2	3	1	2

$$(14) \quad 240 = 10 \times 2 \times 12 \left\{ \begin{array}{r} \text{qrs. bus. pks. gals. qts.} \\ (10) \begin{array}{r} 950 \\ 2) 95 \quad 0 \quad 2 \quad 0 \quad 0 \\ 12) 47 \quad 4 \quad 1 \quad 0 \quad 0 \\ \hline 3 \quad 7 \quad 2 \quad 1 \quad 2 \end{array} \end{array} \right. 0 + 240$$

$$(15) \quad 225 = 5 \times 5 \times 9 \left\{ \begin{array}{r} \text{mo. wks. dys. hrs.} \\ (5) \begin{array}{r} 13 \quad 1 \quad 4 \quad 0 \\ 5) 2 \quad 2 \quad 5 \quad 0 \\ 9) 0 \quad 2 \quad 1 \quad 0 \\ \hline 0 \quad 0 \quad 1 \quad 16 \end{array} \end{array} \right. + 225$$

$$(16) \quad 324 = 4 \times 9 \times 9 \left\{ \begin{array}{r} \text{mo. wks. dys. hrs.} \\ (4) \begin{array}{r} 10 \quad 2 \quad 3 \quad 0 \\ 9) 2 \quad 2 \quad 4 \quad 6 \\ 9) 0 \quad 1 \quad 1 \quad 6 \\ \hline 0 \quad 0 \quad 0 \quad 22 \end{array} \end{array} \right. + 324$$

EXERCISE XV., p. 25.

- | | | |
|-----------------|-----------------|------------------|
| (1) £1 15s. 0d. | (2) £6 8s. 8d. | (3) £3 13s. 4d. |
| (4) £5 16s. 8d. | (5) £2 12s. 6d. | (6) £12 16s. 0d. |
| (7) £9 7s. 6d. | (8) £42 2s. 6d. | |

$$(9) \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 43) 2173 \quad 5 \quad 10 \quad (\text{£}50 \\ \underline{215} \\ 23 \\ \underline{20} \\ 465 \quad (10\text{s.} \\ \underline{43} \\ 35 \\ \underline{12} \\ 430 \quad (10\text{d.} \\ \underline{430} \\ \dots \end{array}$$

Ans. = £50 10s. 10d.

$$(10) \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 3400) 239445 \quad 0 \quad 0 \quad (\text{£}70 \\ \underline{23800} \\ 1445 \\ \underline{1445} \\ 20 \\ \underline{20} \\ 28900 \quad (8\text{s.} \\ \underline{27200} \\ 1700 \\ \underline{1700} \\ 20400 \quad (6\text{d.} \\ \underline{20400} \\ \dots \end{array}$$

Ans. = £70 8s. 6d.

	£	s.	d.		£	s.	d.
(11)	4500	22876	2	6	(£7	(12)	17880
		31500				17880	11
		1876				7962	8
		20				20	(£100
		27562	6s.			159251	6s.
		27090				142880	
		562				16371	
		12				12	
		6750	1d.			196460	11d.
		4500				196460	
		2250				.....
		4				Ans. = £100	8s. 11d.
		5000	2f.				
		5000					
						
		Ans. = £7	6s. 1½d.				

	£	s.	d.		£	s.	d.
(13)	36000	113812	10	0	(£3	(14)	78
		108000				1100	10
		5812				78	7½
		20				320	(£14
		116250	3s.			312	
		108000				8	
		8250				20	
		12				170	2s.
		99000	2d.			156	
		72000				14	
		27000				12	
		4				175	2d.
		108000	3f.			156	
		108000				19	
		.....				4	
		Ans. = £3	3s. 2½d.			78	1f.
						78	
						..	
						Ans. = £14	2s. 2½d.

$$\begin{array}{r}
 15) \quad 104) \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 866 \quad 0 \quad 4 \text{ (£8} \\ \hline 832 \\ \hline 34 \\ \hline 20 \\ \hline 680 \text{ (6s.} \\ \hline 624 \\ \hline 56 \\ \hline 12 \\ \hline 676 \text{ (6d.} \\ \hline 624 \\ \hline 52 \\ \hline 4 \\ \hline 208 \text{ (2f.} \\ \hline 208 \\ \hline \dots \end{array}
 \end{array}$$

Ans. = £8 6s. 8½d.

$$(16) \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 2) \quad 3632 \quad 19 \quad 1\frac{1}{2} + 154 \\ \hline 11) \quad 1816 \quad 9 \quad 6\frac{1}{2} \\ \hline 7) \quad 165 \quad 2 \quad 8\frac{1}{2} \\ \hline 23 \quad 11 \quad 9\frac{1}{2} \end{array}$$

$$(17) \quad 123) \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 2117 \quad 15 \quad 6\frac{1}{2} \text{ (£17} \\ \hline 123 \\ \hline 887 \\ \hline 861 \\ \hline 26 \\ \hline 20 \\ \hline 535 \text{ (4s.} \\ \hline 492 \\ \hline 43 \\ \hline 12 \\ \hline 522 \text{ (4d.} \\ \hline 492 \\ \hline 30 \\ \hline 4 \\ \hline 123 \text{ (1f.} \\ \hline 123 \\ \hline \dots \end{array}$$

Ans. = £17 4s. 4½d.

$$(18) \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 6) \quad 672 \quad 17 \quad 3 + 54 \\ \hline 9) \quad 112 \quad 2 \quad 10\frac{1}{2} \\ \hline 12 \quad 9 \quad 2\frac{1}{2} \end{array}$$

	£	s.	d.
(19) 203)	195	14	4 5 (£96
	1837		
	<hr/>		
	1244		
	1218		
	<hr/>		
	26		
	30		
	<hr/>		
	524	(3s.	
	406		
	<hr/>		
	118		
	12		
	<hr/>		
	1421	(7d.	
	1421		
	<hr/>		
		
Ans.	= £96	2s. 7d.	

	£	s.	d.
(20) 279)	371	2	6½ (£1
	279		
	<hr/>		
	92		
	20		
	<hr/>		
	1842	(6s.	
	1674		
	<hr/>		
	168		
	12		
	<hr/>		
	2022	(7d.	
	1953		
	<hr/>		
	69		
	4		
	<hr/>		
	279	(1f.	
	279		
	<hr/>		
	...		
Ans.	= £1	6s. 7½d.	

	lbs.	oz.	dwt.
(21) 711)	2592	2	5 (3 lbs.
	2123		
	<hr/>		
	469		
	12		
	<hr/>		
	5510	(7 oz.	
	4977		
	<hr/>		
	533		
	20		
	<hr/>		
	10665	(15 dwts.	
	711		
	<hr/>		
	3555		
	3555		
	<hr/>		
		
Ans.	= 3 lbs.	7 oz. 15 dwts.	

	tons	cwt.	qrs.
(22) 917)	813	16	3 (0 tons
	20		
	<hr/>		
	16276	(17 cwt.	
	917		
	<hr/>		
	7106		
	6419		
	<hr/>		
	687		
	4		
	<hr/>		
	2751	(3 qrs.	
	2751		
	<hr/>		
		
Ans.	= 17 cwt.	3 qrs.	

mls. fur. pls. yd. ft. in.									
1)	317)	778	2	39	1	2	7	(2 mls.	
		634							
		139		(24)	523)	834	1	2	16 0 26 (1A.
		8				523			
		1114	(3 fur.			311			
		951				4			
		163				1245	(2R.		
		40				1046			
		6559	(20P.			199			
		634				40			
		219				7962	(15P.		
		5½				523			
		1096				2732			
		109½				2615			
		1205½	(8 yds.			117			
		951				30½			
		254½				3526			
		3				29½			
		765½	(2 ft.			3555½	(6 yds.		
		634				3138			
		131½				417½			
		12				9			
		1585	(5 in.			3755½	(7 ft.		
		1585				3661			
		....				94½			
						144			
						438			
						376			
						94			
						13598	(26 in.		
						1046°			
						3138			
						3138			
								

s. = 2 mls. 3 fur. 20 pls. 3 yds. 2 ft. 5 in.

Ans. = 1A. 2R. 15P. 6 yds. 7 ft. 26 in.

$$\begin{array}{r}
 \text{£} \quad \text{s.} \quad \text{d.} \\
 (25) \quad 28 \quad 17 \quad 9\frac{1}{2} + 4 \quad 2 \quad 6\frac{1}{2} \\
 \hline
 20 \qquad \qquad 20 \\
 577\text{s.} \qquad \qquad 82\text{s.} \\
 12 \qquad \qquad 12 \\
 \hline
 6933\text{d.} \qquad \qquad 990\text{d.} \\
 2 \qquad \qquad 2 \\
 \hline
 13867 \text{ hl. d.} \qquad 1981 \text{ hl. d.}
 \end{array}$$

$$\therefore 13867 + 1981 = 7.$$

$$\begin{array}{r}
 \text{£} \quad \text{s.} \quad \text{d.} \\
 (26) \quad 10 \quad 1 \quad 9\frac{1}{2} + 2 \quad 0 \quad 4\frac{1}{2} \\
 \hline
 20 \qquad \qquad 20 \\
 201\text{s.} \qquad \qquad 40\text{s.} \\
 12 \qquad \qquad 12 \\
 \hline
 2421\text{d.} \qquad \qquad 484\text{d.} \\
 4 \qquad \qquad 4 \\
 \hline
 9685\text{f.} \qquad \qquad 1937\text{f.}
 \end{array}$$

$$\therefore 9685 + 1937 = 5.$$

$$\begin{array}{r}
 \text{£} \quad \text{s.} \quad \text{d.} \\
 (27) \quad 36 \quad 7 \quad 1\frac{1}{2} + 6 \quad 1 \quad 2\frac{1}{2} \\
 \hline
 20 \qquad \qquad 20 \\
 797\text{s.} \qquad \qquad 121\text{s.} \\
 12 \qquad \qquad 12 \\
 \hline
 8726\text{d.} \qquad \qquad 1454\text{d.} \\
 4 \qquad \qquad 4 \\
 \hline
 84902\text{f.} \qquad \qquad 5817\text{f.} \\
 \therefore 84902 + 5817 = 6.
 \end{array}$$

$$\begin{array}{r}
 \text{£} \quad \text{s.} \quad \text{d.} \\
 (28) \quad 6916 \quad 10 \quad 5 + 406 \quad 17 \quad 1 \\
 \hline
 20 \qquad \qquad 20 \\
 138330\text{s.} \qquad \qquad 8137\text{s.} \\
 12 \qquad \qquad 12 \\
 \hline
 1659965\text{d.} \qquad \qquad 97645\text{d.} \\
 \therefore 1659965 + 97645 = 17.
 \end{array}$$

EXERCISE XVI., p. 26.

- (1) $13\text{s. } 4\text{d.} \times 721 = £480 \text{ } 13\text{s. } 4\text{d.}$
 (2) Expenses per week = $(2\text{s.} \times 7) + 2\text{s. } 6\text{d.}$, or $16\text{s. } 6\text{d.}$.
 \therefore he saves per month $(£1 \text{ } 4\text{s. } 6\text{d.} - 16\text{s. } 6\text{d.}) \times 4$, or $£1 \text{ } 12\text{s.}$
 (3) Expenses = $£28 \text{ } 9\text{s. } 6\text{d.} + £20 \text{ } 12\text{s. } 9\text{d.} + £5$, or $£54 \text{ } 2\text{s. } 3\text{d.}$.
 \therefore money left = $£100 - £54 \text{ } 2\text{s. } 3\text{d.}$, or $£45 \text{ } 17\text{s. } 9\text{d.}$
 (4) $£2 \text{ } 13\text{s. } 0\text{d.} \times 277 = £734 \text{ } 1\text{s. } 0\text{d.}$
 (5) Taxes = $£28 \text{ } 9\text{s. } 6\text{d.} + £12 \text{ } 5\text{s. } 2\text{d.}$, or $£40 \text{ } 14\text{s. } 8\text{d.}$.
 \therefore net income = $£735 \text{ } 10\text{s.} - £40 \text{ } 14\text{s. } 8\text{d.} = £694 \text{ } 15\text{s. } 4\text{d.}$
 (6)

$$\begin{array}{r}
 \text{From } 5000782000246 \\
 \text{take } 2163972759689 \\
 \hline
 2836809240557
 \end{array}$$

- (7)

	£	s.	d.
24 yards of calico @ $9\frac{1}{2}\text{d.}$ per yd.	=	0	19
10 „ „ black cloth @ $10\text{s. } 6\text{d.}$ per yd.	=	5	5
4 pairs of kid gloves @ $2\text{s. } 6\text{d.}$ a pair	=	0	10
2 shawls @ $£2 \text{ } 13\text{s.}$ each	=	5	6
		12	0

 \therefore sum = 12 0 0

- (8) Annual expenditure = $(3s. 4d. + 1s. 5\frac{1}{2}d.) \times 52 = £12\ 9s. 2d.$
 $\therefore £31\ 10s. - £12\ 9s. 2d. = £19\ 0s. 10d.$
- (9) Rent and taxes = $£137\ 10s. + £23\ 12s. 2\frac{1}{2}d. + £2\ 11s. 6\frac{1}{2}d.,$ or
 $£183\ 13s. 8\frac{1}{2}d.$
 $\therefore £500 - £183\ 13s. 8\frac{1}{2}d. = £316\ 6s. 3\frac{1}{2}d.$
- (10) Expenses = $£85\ 11s. 11d. + £24\ 15s. 4d. + £29\ 13s. 8\frac{1}{2}d.$
 $= £140\ 0s. 11\frac{1}{2}d.$
 \therefore clear income $£574\ 12s. 10d. - £140\ 0s. 11\frac{1}{2}d. = £434\ 11s. 10\frac{1}{2}d.$
- (11) Yearly income = $(4s. 9d. \times 6) \times 49 = £69\ 16s. 6d.$
 Expenses per month = $(6s. 10d. \times 4) + £1\ 11s. 7\frac{1}{2}d. = £2\ 18s. 11\frac{1}{2}d.$
 \therefore yearly expenditure = $£2\ 18s. 11\frac{1}{2}d. \times 12 = £38\ 6s. 5\frac{1}{2}d.$
 \therefore gain $£69\ 16s. 6d. - £38\ 6s. 5\frac{1}{2}d. = £31\ 10s. 0\frac{1}{2}d.$
- (12) Cost of 450 sheep = $£42\ 7s. \times \frac{450}{20} = £952\ 17s. 6d.$
 Number of sheep left = $450 - 67 = 383.$
 Selling price = $(£2\ 1s. 6d. \times 383) - £73\ 15s. 10d. = £720\ 18s. 8d.$
 \therefore loss = $£952\ 17s. 6d. - £720\ 18s. 8d. = £231\ 18s. 10d.$
- (13) Number of pens at $\frac{1}{4}d.$ each = $184 \times 20 \times 112 \times 16 \times 30 = 197836800.$
 $\therefore 197836800$ farthings = $£206080.$
- (14) Yearly expenditure = $(£2\ 17s. 10\frac{1}{2}d. \times 52) + (£23\ 16s. 7\frac{1}{2}d. \times 12)$
 $= £150\ 9s. 6d. + £285\ 19s. 3d. = £436\ 8s. 9d.$
 $\therefore £460\ 19s. 6d. - £436\ 8s. 9d. = £24\ 11s.$
- (15) He originally possessed $£16 \times 13 = £208.$
 Money left = $(16 \times 12f.) + £16 = £16\ 4s.$
 \therefore loss = $£208 - £16\ 4s. = £191\ 16s.$
- (16) Selling price = $6s. 8d. \times \frac{369}{18} = £7\ 13s. 4d.$
 \therefore loss = $£7\ 13s. 4d. + 4 = £1\ 18s. 4d.$
- (17) No. of c. ft. consumed per month = $10 \times 10 \times 8 \times 28 = 22400.$
 \therefore cost $(22400 \times 7\frac{1}{2}d.) + 1000 = £8\ 8s.$
- (18) 2 tons 1 cwt. 0 qrs. 4 lbs 9 oz. = 73545 oz.
 As 1 oz. = 1d. $\therefore 73545d. = £306\ 8s. 9d.$
- (19) 11 boys @ $4\frac{1}{4}d.$ per week = $4s. 4\frac{1}{4}d.$
 17 „ $2\frac{1}{2}d.$ „ = $3s. 6\frac{1}{2}d.$
 23 „ $1\frac{1}{4}d.$ „ = $2s. 4\frac{1}{4}d.$
 \therefore weekly payments = $10s. 3\frac{1}{2}d.$
 \therefore annual payments $10s. 3\frac{1}{2}d. \times 46 = £23\ 13s. 5d.$
- (20) Expenses of 1st plan = $(7s. 10\frac{1}{2}d. \times 37) + (£57\ 15s. - £52) =$
 $£20\ 5s. 7\frac{1}{2}d.$
 Expense of 2nd plan = $15s. 8d. \times 37 = £28\ 19s. 8d.$
 \therefore difference = $£28\ 19s. 8d. - £20\ 5s. 7\frac{1}{2}d. = £8\ 14s. 0\frac{1}{2}d.$

- (21) Gross income = £35 × 37 = £1295.
 Expenses = (£1 14s. 8d. × 39) + £75 11s. 10½d. = £125 17s. 2½d.
 ∴ clear income £1295 - £125 17s. 2½d. = £1169 2s. 9½d.
- (22) Expenses = (£1 2s. 7d. × 237) + £672 17s. 7½d. = £940 9s. 10½d.
 ∴ net income = £1201 2s. - £940 9s. 10½d. = £260 12s. 1½d.
- (23) Yearly expenditure = £2 18s. 10½d. × 365 = £1074 9s. 4½d.
 ∴ he saves (£2000 - £1074 9s. 4½d.) × 2 = £1851 1s. 8d.
- (24) Loss = (14d. × 2) + (17s. × 2) + (£1 × 2) = £3 16s. 4d.
- (25) Gain on silk = (8s. 11½d. - 7s. 10½d.) × 37 = £2 0s. 10½d.
 Loss on velvet = (16s. 9½d. - 16s. 5½d.) × 43 = 15s. 2½d.
 ∴ gain on whole = £2 0s. 10½d. - 15s. 2½d. = £1 5s. 7½d.
- (26) £9 10s. 2½d. + 17 = 11s. 2½d.
- (27) Expenses = 3s. 4d. + 11s. 6d. + 7s. 10d. + 1s. 3d. + £4 1s. 7d. + 2s. 6d.
 + 1s. 4d. + 8s. 3½d. = £5 17s. 7½d.
 ∴ left = £10 - £5 17s. 7½d. = £4 2s. 4½d.
- (28) Cost of 2nd carriage = £176 15s. 7d. + £12 17s. 3½d. + £27 13s. 2½d.
 + £3 11s. 8d. + £13 13s. = £234 10s. 8½d.
 Selling price of repaired carriage = £126 + £12 17s. 3½d.
 + £27 13s. 2½d. + £3 11s. 8d. + £13 13s. = £183 15s. 1¾d.
 ∴ gain = £183 15s. 1¾d. - £176 15s. 7d. = £6 19s. 6¾.
- (29) Expenses per week = 2s. 3d. + 13s. 5½d. = 15s. 8½d.
 ∴ money left = (£1 7s. 10d. - 15s. 8½d.) × 52 = £31 11s. 7d.
- (30) Number of poor above 70 = 238 - 79, or 159.
 ∴ each receives £2999 16s. + 159 = £18 17s. 4d.
- (31) £576 6s. 8d. + £1 1s. 8d. = 138320d. ÷ 260d., or 532 quarters.
- (32) Three receive each (£70 - £5 10s.) ÷ 4, or £16 2s. 6d.
 ∴ fourth receives £16 2s. 6d. + £5 10s., or £21 12s. 6d.
- (33) £31 = 2480 threepenny pieces.
 1 guinea, half-guinea, crown, florin, and threepenny piece = 84 + 42
 + 20 + 8 + 1, or 155 threepenny pieces.
 ∴ 2480 + 155 = 16.
- (34) 17 mls. + 3 mls. 3 fur. 8 pls. = 5440 pls. + 1088 pls., or 5 hours.
- (35)
- | s. | d. | £ | s. | d. |
|----|------------------|------------------|----|----|
| 4 | 3 × 10 × 18 = 38 | 5 | 0 | |
| 3 | 9 × 12 × 18 = 40 | 10 | 0 | |
| 2 | 6 × 17 × 18 = 38 | 5 | 0 | |
| | | ∴ sum = £117 0 0 | | |

- (36) Gain on 2 cwt. = £36 16s. 10½d. - £33 16s. 2½d., or £3 0s. 8d.
 ∴ gain per lb. = £3 0s. 8d. ÷ (2 × 112) lbs. = 3½d.
- (37) Selling price = 2s. 1½d. × 406 lbs., or £42 14s. 3½d.
 ∴ entire gain = £42 14s. 3½d. - £37 18s. 9½d., or £4 15s. 6d.
- (38) 17 yds. 3 qrs. 1 nl. = 14 E. ells 1 qr. 1 nl.
 ∴ 14 E. ells 1 qr. 1 nl. × 58 = 826 E. ells 2 qrs. 2 nls.
- (39) 18 lbs. 9 oz. 11 drs. × 75 = 12 cwt. 1 qr. 23 lbs. 6 oz. 9 qrs.
 ∴ net weight = 11 tons 0 cwt. 0 qrs. 7 lbs. 10 oz. - 12 cwt. 1 qr.
 23 lbs. 6 oz. 9 drs. = 10 tons 7 cwt. 2 qrs. 12 lbs. 3 oz. 7 drs.
- (40) Yearly expenditure = £10 3s. 7¾d. × 52, or £529 9s. 7d.
 ∴ he saves (£580 - £529 9s. 7d.) × 5 = £2 12s. 1d.
- (41) Number of yards bought = 49 × 3, or 147.
 Selling price = 6s. 7½d. × 147, or £48 10s. 9¾d.
 ∴ gain = £48 10s. 9¾d. - £47 12s. 9½d., or 18s. 0½d.
- (42) (£1 11s. 5½d. - 19s. 10½d.) × 52 = £30 1s. 3d.
 ∴ he saves £30 1s. 3d. - £8 7s. 10½d. = £21 13s. 4½d.
- (43)
- | | £ | s. | d. | | £ | s. | d. |
|------------|---|----|----|----------|-------------------|----|----|
| 34 receive | 1 | 7 | 8½ | × 34, or | 47 | 1 | 4½ |
| 23 „ | | 18 | 2½ | × 23, or | 20 | 19 | 3½ |
| 28 „ | | 14 | 2 | × 28, or | 19 | 16 | 8 |
| | | | | | ∴ sum = £87 17 3½ | | |
- (44) Cost of gunpowder = 5s. 7¾d. × 332 cwt., or £93 14s. 5d.
 ∴ cost of saltpetre = ¾ of £93 14s. 5d., or £70 5s. 9¾d.
- (45) Gain on tea = (3s. 4d. - 2s. 6d.) × 3 × 64 = 1920d., or £8.
 Gain on sugar = (5½d. - 4d.) × 2 × 160 = 480d., or £2.
 Gain on sundries = £270 13s. 6d. - £216 15s. 7d., or £53 17s. 11d.
 ∴ gain in one year = (£8 + £2 + £53 17s. 11d.) × 6, or £383 7s. 6d.
- (46) £48 5s. = 3860 threepenny pieces; but 1 sovereign, half-sovereign, seven shilling piece, crown, half-crown, florin, shilling, sixpence, and threepenny piece = 80 + 40 + 28 + 20 + 10 + 8 + 4 + 2 + 1, or 193 threepenny pieces.
 ∴ 3860 ÷ 193 = 20.

$$\begin{array}{rcl}
 \text{(47)} & \begin{array}{cc} s. & d. \end{array} & \begin{array}{cc} £ & s. & d. \end{array} \\
 & 2 & 6 \times 52 \times 47 = 305 \quad 10 \quad 0 \\
 & 3 & 4 \times 52 \times 30 = 260 \quad 0 \quad 0 \\
 & 5 & 0 \times 52 \times 15 = 195 \quad 0 \quad 0 \\
 & & £50 \times 4 = 200 \quad 0 \quad 0
 \end{array}$$

$$\text{Rents} = £960 \quad 10 \quad 0$$

$$\text{Expenses} = £5 \quad 1s. \quad 0d. + £4 \quad 6s. \quad 8d. + £3 \quad 5s. \quad 0d. + £3 \quad 6s. \quad 8d. \\ + £314 \quad 17s. \quad 11d. + £112 \quad 16s. \quad 7d., \text{ or } £443 \quad 14s. \quad 8d.$$

$$\therefore \text{entire gain} = £960 \quad 10s. \quad 0d. - £443 \quad 14s. \quad 8d., \text{ or } £516 \quad 15s. \quad 4d.$$

$$\begin{array}{r}
 \text{(48)} \quad 324567000034296 \\
 \underline{139784376278457}
 \end{array}$$

$$12) 184782623755839 \text{ inches.}$$

$$8) 15398551979653 \text{ . 3 ins.}$$

$$\underline{5132850659884} \text{ . 1 ft.}$$

$$5\frac{1}{2} \text{ yds.} = \frac{11}{2} \text{ yds.} \quad \underline{2}$$

$$11) 10265701319768$$

$$4,0) 93324557452,4 \text{ . 4 hl. yds.} = 2 \text{ yds.}$$

$$8) 23331139363 \text{ . 4 pls.}$$

$$\underline{2916392420} \text{ . 3 fur.}$$

$$2916392420 \text{ mls. 3 fur. 4 pls. 2 yds. 1 ft. 3 in.}$$

$$\text{(49) Income} = £49 \quad 15s. \quad 8d. \div \frac{4}{240} \text{ or } \frac{1}{60} = £2987.$$

(50) Each man has 12 times, and each woman 4 times, as much as a child.

$$\therefore 12 \text{ men, 14 women, and 20 children} = 220 \text{ children.}$$

$$\therefore \text{Child receives } £1332 \quad 7s. \quad 6d. \div 220 = £6 \quad 1s. \quad 1\frac{1}{2}d.$$

$$\text{Woman receives } £6 \quad 1s. \quad 1\frac{1}{2}d. \times 4 = £24 \quad 4s. \quad 6d.$$

$$\text{Man receives } £24 \quad 4s. \quad 6d. \times 3 = £72 \quad 13s. \quad 6d.$$

EXERCISE XVII., p. 32.

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| (1) 118. | (2) 213. | (3) 81. | (4) 37. | (5) 1. |
| (6) 41. | (7) 71. | (8) 83. | (9) 89. | (10) 87. |
| (11) 91. | (12) 97. | (13) 101. | (14) 103. | (15) 107. |
| (16) 109. | (17) 333. | (18) 283. | (19) 41. | (20) 293. |

$$(21) \quad 233289) 483000 (2 \\ \underline{466578}$$

$$16422) 233289 (14 \\ \underline{16422}$$

$$\underline{69069} \\ 65688$$

$$(22) \quad 113569) 337000 (2 \\ \underline{227138}$$

$$3381) 16422 (4 \\ \underline{13524}$$

$$109862) 113569 (1 \\ \underline{109862}$$

$$2898) 3381 (1 \\ \underline{2898}$$

$$3707) 109862 (29 \\ \underline{7414}$$

$$483) 2898 (6 \\ \underline{2898}$$

$$\underline{35722} \\ 33363$$

....

$$2359) 3707 (1 \\ \underline{2359}$$

$$(23) \quad 30081) 73441 (2 \\ \underline{60162}$$

$$1348) 2359 (1 \\ \underline{1348}$$

$$13279) 30081 (2 \\ \underline{26558}$$

$$1011) 1348 (1 \\ \underline{1011}$$

$$3523) 13279 (3 \\ \underline{10569}$$

$$337) 1011 (3 \\ \underline{1011}$$

$$2710) 3523 (1 \\ \underline{2710}$$

....

$$813) 2710 (3 \\ \underline{2439}$$

$$271) 813 (3 \\ \underline{813}$$

...

(24)

$$\begin{array}{r}
 619369)7870000(12 \\
 \underline{619369} \\
 1676310 \\
 \underline{1238738} \\
 437572)619369(1 \\
 \underline{437572} \\
 181797)437572(2 \\
 \underline{363594} \\
 966289)4915000(5 \quad 73978)181797(2 \\
 \underline{4831445} \quad \underline{147956} \\
 83555)966289(11 \quad 33841)73978(2 \\
 \underline{83555} \quad \underline{67682} \\
 130739 \quad 6296)33841(5 \\
 \underline{83555} \quad \underline{31480} \\
 47184)83555(1 \quad 2361)6296(2 \\
 \underline{47184} \quad \underline{4722} \\
 36371)47184(1 \quad 1574)2361(1 \\
 \underline{36371} \quad \underline{1574} \\
 10813)36371(3 \quad 787)1574(2 \\
 \underline{32439} \quad \underline{1574} \\
 3932)10813(2 \quad \\
 \underline{7864} \\
 2949)3932(1 \\
 \underline{2949} \\
 983)2949(3 \\
 \underline{2949} \\

 \end{array}$$

EXERCISE XVIII., p. 32.

(1) $5\frac{6}{7} = \frac{(5 \times 7) + 6}{7} = \frac{41}{7}$. (2) $10\frac{1}{9} = \frac{(10 \times 9) + 1}{9} = \frac{91}{9}$.

(3) $35\frac{3}{7} = \frac{(35 \times 7) + 3}{7} = \frac{248}{7}$. (4) $81\frac{1}{11} = \frac{(81 \times 11) + 1}{11} = \frac{892}{11}$.

(5) $43\frac{4}{15} = \frac{(43 \times 15) + 4}{15} = \frac{649}{15}$. (6) $13\frac{3}{17} = \frac{(13 \times 17) + 3}{17} = \frac{224}{17}$.

$$(7) 121\frac{1}{21} = \frac{(121 \times 21) + 1}{21} = \frac{2542}{21}.$$

$$(8) 14\frac{1}{135} = \frac{(14 \times 135) + 1}{135} = \frac{1891}{135}.$$

$$(9) 987\frac{6}{25} = \frac{(987 \times 25) + 6}{25} = \frac{24681}{25}.$$

$$(10) 88\frac{7}{41} = \frac{(88 \times 41) + 7}{41} = \frac{3615}{41}. \quad (11) 97\frac{61}{71} = \frac{(97 \times 71) + 61}{71} = \frac{6948}{71}.$$

$$(12) 156\frac{513}{514} = \frac{(156 \times 514) + 513}{514} = \frac{80697}{514}.$$

$$(13) 793\frac{16}{183} = \frac{(793 \times 183) + 16}{183} = \frac{145135}{183}.$$

$$(14) 693\frac{31}{100} = \frac{(693 \times 100) + 31}{100} = \frac{69331}{100}.$$

$$(15) 560\frac{441}{1000} = \frac{(560 \times 1000) + 441}{1000} = \frac{560441}{1000}.$$

$$(16) 48\frac{73}{83} = \frac{(48 \times 83) + 73}{83} = \frac{4057}{83}.$$

$$(17) 96\frac{84}{91} = \frac{(96 \times 91) + 84}{91} = \frac{8820}{91}. \quad (18) 89\frac{16}{17} = \frac{(89 \times 17) + 16}{17} = \frac{1529}{17}.$$

$$(19) 189\frac{17}{189} = \frac{(189 \times 189) + 17}{189} = \frac{35738}{189}.$$

$$(20) 234\frac{21}{178} = \frac{(234 \times 178) + 21}{178} = \frac{41673}{178}.$$

$$(21) 118\frac{71}{100} = \frac{(118 \times 100) + 71}{100} = \frac{11871}{100}.$$

$$(22) 634\frac{91}{500} = \frac{(634 \times 500) + 91}{500} = \frac{317091}{500}.$$

$$(23) 189\frac{15}{103} = \frac{(189 \times 103) + 15}{103} = \frac{19482}{103}.$$

$$(24) 586\frac{17}{118} = \frac{(586 \times 118) + 17}{118} = \frac{69165}{118}.$$

$$(25) 869\frac{189}{190} = \frac{(869 \times 190) + 189}{190} = \frac{165299}{190}.$$

EXERCISE XIX., p. 33.

$$(1) \frac{24}{7} = 4\frac{6}{7}.$$

$$(2) \frac{84}{9} = 9\frac{8}{9}.$$

$$(3) \frac{141}{16} = 11\frac{1}{16}.$$

$$(4) \frac{232}{3} = 86\frac{2}{3} = 86\frac{2}{3}.$$

$$(5) \frac{179}{13} = 13\frac{1}{13}.$$

$$(6) \frac{492}{21} = 23\frac{4}{7}.$$

$$(7) \frac{147}{37} = 22\frac{1}{37}.$$

$$(8) \frac{5948}{71} = 83\frac{16}{71}.$$

$$(9) \frac{1213}{14} = 86\frac{9}{14} = 86\frac{9}{14}.$$

- (10) $\frac{1076}{300} = 10\frac{76}{300} = 10\frac{19}{75}$. (11) $\frac{100824}{1000} = 100\frac{824}{1000} = 100\frac{103}{125}$.
 (12) $\frac{2287}{91} = 102\frac{5}{91}$. (13) $\frac{10820}{104} = 104\frac{4}{104} = 104\frac{1}{26}$. (14) $\frac{7226}{89} = 80\frac{5}{89}$.
 (15) $\frac{5555}{55} = 101$. (16) $\frac{5943}{333} = 17\frac{333}{333} = 17\frac{24}{111}$.
 (17) $\frac{2784}{50} = 136\frac{34}{50} = 136\frac{17}{25}$. (18) $\frac{447}{21} = 10\frac{37}{21}$.
 (19) $\frac{6273}{111} = 62\frac{21}{111}$. (20) $\frac{86500}{1100} = 78\frac{7}{11}$.
 (21) $\frac{28678}{500} = 197\frac{178}{500} = 197\frac{89}{250}$. (22) $\frac{85874}{818} = 104\frac{818}{818} = 104\frac{135}{135}$.
 (23) $\frac{28643}{813} = 192\frac{339}{813}$. (24) $\frac{18765}{30} = 625\frac{15}{30} = 625\frac{1}{2}$.
 (25) $\frac{28457}{5000} = 19\frac{1457}{5000}$.

EXERCISE XX., p. 33.

- (1) 5) $\frac{2350}{2350} = 5$ $\frac{650}{650} = 9$ $\frac{90}{117} = \frac{10}{13}$. (2) 3) $\frac{87}{174} = 29$ $\frac{29}{88} = \frac{1}{3}$.
 (3) 3) $\frac{1247}{1247} = 69$ $\frac{949}{708} = \frac{11}{12}$. (4) 8) $\frac{1088}{1334} = 17$ $\frac{136}{153} = \frac{8}{9}$.
 (5) 12) $\frac{1872}{3036} = 13$ $\frac{156}{156} = \frac{12}{12}$. (6) 8794) $\frac{8794}{43970} = \frac{1}{2}$.
 (7) 111) $\frac{1110}{1111} = \frac{10}{11}$. (8) 153) $\frac{2295}{2244} = \frac{15}{12}$.
 (9) 7789) $\frac{28945}{27734} = \frac{5}{2}$. (10) 1873) $\frac{2865}{31641} = \frac{5}{17}$.
 (11) 423) $\frac{13113}{13538} = \frac{31}{42}$.
 (12) 5) $\frac{2075}{2505} = 9$ $\frac{1215}{1701} = 9$ $\frac{125}{185} = 3$ $\frac{15}{21} = \frac{5}{7}$.
 (13) 305) $\frac{2745}{2885} = \frac{9}{13}$. (14) 245) $\frac{1715}{3875} = \frac{7}{15}$.
 (15) 5063) $\frac{25819}{28071} = \frac{13}{17}$. (16) 9) $\frac{4536}{7871} = 9$ $\frac{504}{818} = 7$ $\frac{56}{51} = \frac{8}{13}$.
 (17) 503) $\frac{1509}{8835} = \frac{3}{15}$. (18) 8) $\frac{7488}{11520} = 6$ $\frac{226}{1440} = 12$ $\frac{156}{240} = \frac{13}{20}$.
 (19) 8576) $\frac{171520}{180054} = \frac{20}{21}$. (20) 5943) $\frac{101031}{108574} = \frac{17}{12}$.
 (21) 12221) $\frac{26662}{28884} = \frac{2}{3}$. (22) 11111) $\frac{122221}{133332} = \frac{11}{12}$.
 (23) 2222) $\frac{24442}{25888} = \frac{11}{12}$. (24) 5687) $\frac{90679}{110437} = \frac{17}{11}$.
 (25) 5697) $\frac{108142}{185118} = \frac{19}{25}$. (26) 20736) $\frac{82208}{108800} = \frac{2}{3}$.
 (27) 119716) $\frac{239432}{255118} = \frac{2}{3}$. (28) 87025) $\frac{281075}{808175} = \frac{7}{21}$.
 (29) 3939) $\frac{90597}{114331} = \frac{23}{25}$. (30) 60750) $\frac{182250}{486000} = \frac{3}{8}$.
 (31) 37139) $\frac{37139}{488507} = \frac{1}{13}$. (32) 8064) $\frac{169244}{177208} = \frac{21}{22}$.
 (33) 34265) $\frac{1679285}{1713325} = \frac{10}{11}$. (34) 288369) $\frac{2883321}{2883325} = \frac{2}{5}$.
 (35) 227485) $\frac{5233155}{8597085} = \frac{23}{35}$. (36) 168921) $\frac{875684}{1855131} = \frac{1}{2}$.
 (37) 142857) $\frac{257142}{999999} = \frac{5}{7}$. (38) 1051392) $\frac{11565312}{13888098} = \frac{11}{13}$.
 (39) 4371933128) $\frac{20802531896}{48091284408} = \frac{7}{11}$. (40) 6689701368) $\frac{341174769768}{347884471136} = \frac{61}{62}$.

EXERCISE XXI., p. 34.

- (1) $\frac{1}{2}$ of $\frac{5}{4}$ of $\frac{3}{4} = \frac{15}{32}$. (2) $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{3}{1} = \frac{2}{3} = 1\frac{2}{3}$.

$$(3) \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } \frac{5}{6} \text{ of } \frac{3}{4} = \frac{1}{2}.$$

$$(4) \frac{5}{4} \text{ of } \frac{11}{3} \text{ of } \frac{2}{5} \text{ of } \frac{7}{11} = \frac{7}{4} = 1\frac{3}{4}.$$

$$(5) \frac{4}{5} \text{ of } \frac{5}{6} \text{ of } \frac{6}{7} \text{ of } \frac{7}{8} = \frac{1}{2}.$$

$$(6) \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } \frac{4}{5} = \frac{1}{5}.$$

$$(7) \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } \frac{11}{12} \text{ of } \frac{2}{3} = \frac{1}{3}.$$

$$(8) \frac{37}{11} \text{ of } \frac{5}{37} \text{ of } \frac{12}{11} \text{ of } \frac{121}{12} = 5.$$

$$(9) \frac{17}{4} \text{ of } \frac{18}{3} \text{ of } \frac{3}{2} \text{ of } \frac{5}{2} \text{ of } \frac{12}{1} = 15 = 3\frac{3}{2}.$$

$$(10) \frac{3}{4} \text{ of } \frac{28}{5} \text{ of } \frac{15}{4} \text{ of } \frac{1}{56} \text{ of } \frac{2}{3} = \frac{2}{3}.$$

$$(11) \frac{4}{28} \text{ of } \frac{2}{3} \text{ of } \frac{30}{77} \text{ of } \frac{1}{14} \text{ of } \frac{17}{5} \text{ of } \frac{3}{24} = \frac{1}{4}.$$

$$(12) \frac{12}{7} \text{ of } \frac{11}{3} \text{ of } \frac{1}{12} \text{ of } \frac{28}{11} \text{ of } \frac{17}{13} \text{ of } \frac{5}{66} = \frac{5}{6}.$$

$$(13) \frac{54}{2} \text{ of } \frac{14}{3} \text{ of } \frac{27}{64} \text{ of } \frac{15}{14} \text{ of } \frac{16}{3} \text{ of } \frac{14}{5} = 196.$$

$$(14) \frac{1}{220} \text{ of } \frac{20}{3} \text{ of } \frac{28}{5} \text{ of } \frac{15}{3} \text{ of } \frac{45}{11} = 1.$$

$$(15) \frac{4}{11} \text{ of } \frac{23}{7} \text{ of } \frac{100}{11} \text{ of } \frac{11}{60} \text{ of } \frac{3}{2} \text{ of } \frac{7}{11} = 9.$$

$$(16) \frac{74}{2} \text{ of } \frac{21}{16} \text{ of } \frac{1}{27} \text{ of } \frac{14}{3} \text{ of } \frac{2}{56} \text{ of } \frac{18}{3} = \frac{7}{2} = 3\frac{1}{2}.$$

$$(17) \frac{28}{3} \text{ of } \frac{5}{6} \text{ of } \frac{7}{8} \text{ of } \frac{11}{12} \text{ of } \frac{13}{14} \text{ of } \frac{15}{16} \text{ of } \frac{17}{18} \text{ of } \frac{19}{20} \text{ of } \frac{21}{22} \text{ of } \frac{23}{24} \text{ of } \frac{25}{26} \text{ of } \frac{27}{28} \text{ of } \frac{29}{30} \text{ of } \frac{31}{32} \text{ of } \frac{33}{34} \text{ of } \frac{35}{36} \text{ of } \frac{37}{38} \text{ of } \frac{39}{40} \text{ of } \frac{41}{42} \text{ of } \frac{43}{44} \text{ of } \frac{45}{46} \text{ of } \frac{47}{48} \text{ of } \frac{49}{50} \text{ of } \frac{51}{52} \text{ of } \frac{53}{54} \text{ of } \frac{55}{56} \text{ of } \frac{57}{58} \text{ of } \frac{59}{60} \text{ of } \frac{61}{62} \text{ of } \frac{63}{64} \text{ of } \frac{65}{66} \text{ of } \frac{67}{68} \text{ of } \frac{69}{70} \text{ of } \frac{71}{72} \text{ of } \frac{73}{74} \text{ of } \frac{75}{76} \text{ of } \frac{77}{78} \text{ of } \frac{79}{80} \text{ of } \frac{81}{82} \text{ of } \frac{83}{84} \text{ of } \frac{85}{86} \text{ of } \frac{87}{88} \text{ of } \frac{89}{90} \text{ of } \frac{91}{92} \text{ of } \frac{93}{94} \text{ of } \frac{95}{96} \text{ of } \frac{97}{98} \text{ of } \frac{99}{100} = \frac{41}{12} = 3\frac{5}{12}.$$

$$(18) \frac{13}{2} \text{ of } \frac{7}{2} \text{ of } \frac{11}{2} \text{ of } \frac{13}{2} \text{ of } \frac{15}{2} \text{ of } \frac{17}{2} \text{ of } \frac{19}{2} \text{ of } \frac{21}{2} \text{ of } \frac{23}{2} \text{ of } \frac{25}{2} \text{ of } \frac{27}{2} \text{ of } \frac{29}{2} \text{ of } \frac{31}{2} \text{ of } \frac{33}{2} \text{ of } \frac{35}{2} \text{ of } \frac{37}{2} \text{ of } \frac{39}{2} \text{ of } \frac{41}{2} \text{ of } \frac{43}{2} \text{ of } \frac{45}{2} \text{ of } \frac{47}{2} \text{ of } \frac{49}{2} \text{ of } \frac{51}{2} \text{ of } \frac{53}{2} \text{ of } \frac{55}{2} \text{ of } \frac{57}{2} \text{ of } \frac{59}{2} \text{ of } \frac{61}{2} \text{ of } \frac{63}{2} \text{ of } \frac{65}{2} \text{ of } \frac{67}{2} \text{ of } \frac{69}{2} \text{ of } \frac{71}{2} \text{ of } \frac{73}{2} \text{ of } \frac{75}{2} \text{ of } \frac{77}{2} \text{ of } \frac{79}{2} \text{ of } \frac{81}{2} \text{ of } \frac{83}{2} \text{ of } \frac{85}{2} \text{ of } \frac{87}{2} \text{ of } \frac{89}{2} \text{ of } \frac{91}{2} \text{ of } \frac{93}{2} \text{ of } \frac{95}{2} \text{ of } \frac{97}{2} \text{ of } \frac{99}{2} = \frac{55}{16} = 3\frac{7}{16}.$$

$$(19) \frac{28}{7} \text{ of } \frac{13}{8} \text{ of } \frac{15}{9} \text{ of } \frac{17}{10} \text{ of } \frac{19}{11} \text{ of } \frac{21}{12} \text{ of } \frac{23}{13} \text{ of } \frac{25}{14} \text{ of } \frac{27}{15} \text{ of } \frac{29}{16} \text{ of } \frac{31}{17} \text{ of } \frac{33}{18} \text{ of } \frac{35}{19} \text{ of } \frac{37}{20} \text{ of } \frac{39}{21} \text{ of } \frac{41}{22} \text{ of } \frac{43}{23} \text{ of } \frac{45}{24} \text{ of } \frac{47}{25} \text{ of } \frac{49}{26} \text{ of } \frac{51}{27} \text{ of } \frac{53}{28} \text{ of } \frac{55}{29} \text{ of } \frac{57}{30} \text{ of } \frac{59}{31} \text{ of } \frac{61}{32} \text{ of } \frac{63}{33} \text{ of } \frac{65}{34} \text{ of } \frac{67}{35} \text{ of } \frac{69}{36} \text{ of } \frac{71}{37} \text{ of } \frac{73}{38} \text{ of } \frac{75}{39} \text{ of } \frac{77}{40} \text{ of } \frac{79}{41} \text{ of } \frac{81}{42} \text{ of } \frac{83}{43} \text{ of } \frac{85}{44} \text{ of } \frac{87}{45} \text{ of } \frac{89}{46} \text{ of } \frac{91}{47} \text{ of } \frac{93}{48} \text{ of } \frac{95}{49} \text{ of } \frac{97}{50} \text{ of } \frac{99}{51} = \frac{52}{3} = 17\frac{1}{3}.$$

$$(20) \frac{1}{12} \text{ of } \frac{13}{12} \text{ of } \frac{15}{12} \text{ of } \frac{17}{12} \text{ of } \frac{19}{12} \text{ of } \frac{21}{12} \text{ of } \frac{23}{12} \text{ of } \frac{25}{12} \text{ of } \frac{27}{12} \text{ of } \frac{29}{12} \text{ of } \frac{31}{12} \text{ of } \frac{33}{12} \text{ of } \frac{35}{12} \text{ of } \frac{37}{12} \text{ of } \frac{39}{12} \text{ of } \frac{41}{12} \text{ of } \frac{43}{12} \text{ of } \frac{45}{12} \text{ of } \frac{47}{12} \text{ of } \frac{49}{12} \text{ of } \frac{51}{12} \text{ of } \frac{53}{12} \text{ of } \frac{55}{12} \text{ of } \frac{57}{12} \text{ of } \frac{59}{12} \text{ of } \frac{61}{12} \text{ of } \frac{63}{12} \text{ of } \frac{65}{12} \text{ of } \frac{67}{12} \text{ of } \frac{69}{12} \text{ of } \frac{71}{12} \text{ of } \frac{73}{12} \text{ of } \frac{75}{12} \text{ of } \frac{77}{12} \text{ of } \frac{79}{12} \text{ of } \frac{81}{12} \text{ of } \frac{83}{12} \text{ of } \frac{85}{12} \text{ of } \frac{87}{12} \text{ of } \frac{89}{12} \text{ of } \frac{91}{12} \text{ of } \frac{93}{12} \text{ of } \frac{95}{12} \text{ of } \frac{97}{12} \text{ of } \frac{99}{12} = 5.$$

$$(21) \frac{15}{12} \text{ of } \frac{17}{12} \text{ of } \frac{19}{12} \text{ of } \frac{21}{12} \text{ of } \frac{23}{12} \text{ of } \frac{25}{12} \text{ of } \frac{27}{12} \text{ of } \frac{29}{12} \text{ of } \frac{31}{12} \text{ of } \frac{33}{12} \text{ of } \frac{35}{12} \text{ of } \frac{37}{12} \text{ of } \frac{39}{12} \text{ of } \frac{41}{12} \text{ of } \frac{43}{12} \text{ of } \frac{45}{12} \text{ of } \frac{47}{12} \text{ of } \frac{49}{12} \text{ of } \frac{51}{12} \text{ of } \frac{53}{12} \text{ of } \frac{55}{12} \text{ of } \frac{57}{12} \text{ of } \frac{59}{12} \text{ of } \frac{61}{12} \text{ of } \frac{63}{12} \text{ of } \frac{65}{12} \text{ of } \frac{67}{12} \text{ of } \frac{69}{12} \text{ of } \frac{71}{12} \text{ of } \frac{73}{12} \text{ of } \frac{75}{12} \text{ of } \frac{77}{12} \text{ of } \frac{79}{12} \text{ of } \frac{81}{12} \text{ of } \frac{83}{12} \text{ of } \frac{85}{12} \text{ of } \frac{87}{12} \text{ of } \frac{89}{12} \text{ of } \frac{91}{12} \text{ of } \frac{93}{12} \text{ of } \frac{95}{12} \text{ of } \frac{97}{12} \text{ of } \frac{99}{12} = \frac{17}{4} = 4\frac{1}{4}.$$

$$(22) \frac{13}{8} \text{ of } \frac{15}{8} \text{ of } \frac{17}{8} \text{ of } \frac{19}{8} \text{ of } \frac{21}{8} \text{ of } \frac{23}{8} \text{ of } \frac{25}{8} \text{ of } \frac{27}{8} \text{ of } \frac{29}{8} \text{ of } \frac{31}{8} \text{ of } \frac{33}{8} \text{ of } \frac{35}{8} \text{ of } \frac{37}{8} \text{ of } \frac{39}{8} \text{ of } \frac{41}{8} \text{ of } \frac{43}{8} \text{ of } \frac{45}{8} \text{ of } \frac{47}{8} \text{ of } \frac{49}{8} \text{ of } \frac{51}{8} \text{ of } \frac{53}{8} \text{ of } \frac{55}{8} \text{ of } \frac{57}{8} \text{ of } \frac{59}{8} \text{ of } \frac{61}{8} \text{ of } \frac{63}{8} \text{ of } \frac{65}{8} \text{ of } \frac{67}{8} \text{ of } \frac{69}{8} \text{ of } \frac{71}{8} \text{ of } \frac{73}{8} \text{ of } \frac{75}{8} \text{ of } \frac{77}{8} \text{ of } \frac{79}{8} \text{ of } \frac{81}{8} \text{ of } \frac{83}{8} \text{ of } \frac{85}{8} \text{ of } \frac{87}{8} \text{ of } \frac{89}{8} \text{ of } \frac{91}{8} \text{ of } \frac{93}{8} \text{ of } \frac{95}{8} \text{ of } \frac{97}{8} \text{ of } \frac{99}{8} = \frac{208}{5} = 41\frac{3}{5}.$$

EXERCISE XXII, p. 36.

$$(1) \begin{array}{r} 4) 12, 16 \\ \hline 3, 4 \end{array}$$

$$\therefore 4 \times 3 \times 4 = 48 = \text{L. C. M.}$$

$$(2) \begin{array}{r} 5) 15, 25 \\ \hline 3, 5 \end{array}$$

$$\therefore 5 \times 3 \times 5 = 75 = \text{L. C. M.}$$

$$(3) \begin{array}{r} 6) 8, 12, 18 \\ \hline 2, 3 \end{array}$$

$$\therefore 6 \times 2 \times 3 = 36 = \text{L. C. M.}$$

$$(4) \begin{array}{r} 8, 35, 7 \\ \hline \end{array}$$

$$\therefore 35 = \text{L. C. M.}$$

$$(5) \begin{array}{r} 12) 9, 12, 16, 20 \\ \hline 3, 1, 4, 5 \end{array}$$

$$\therefore 12 \times 3 \times 4 \times 5 = 720 = \text{L. C. M.}$$

$$(6) \begin{array}{r} 7, 8, 21, 63 \\ \hline \end{array}$$

$$\therefore 63 = \text{L. C. M.}$$

$$(7) \begin{array}{r} 4) 8, 6, 4, 12 \\ \hline 2, 3, \quad 3 \end{array}$$

$$\therefore 4 \times 2 \times 3 = 24 = \text{L. C. M.}$$

$$(8) \begin{array}{r} 11) 4, 11, 22, 33 \\ \hline 4, \quad 2, \quad 3 \end{array}$$

$$\therefore 11 \times 4 \times 3 = 132 = \text{L. C. M.}$$

$$(9) \begin{array}{r} 10) 10, 12, 25, 36 \\ \hline 1, \quad 5, 18 \end{array}$$

$$\therefore 10 \times 5 \times 18 = 900 = \text{L. C. M.}$$

$$(10) \begin{array}{r} 4) 12, 16, 20, 28, 30 \\ \hline 3, \quad 4, 13, 15 \end{array}$$

$$\therefore 4 \times 3 \times 13 \times 15 = 780 = \text{L. C. M.}$$

$$(11) \begin{array}{r} 3, 12, 24, 48, 144 \\ \hline \end{array}$$

$$\therefore 144 = \text{L. C. M.}$$

$$(12) \begin{array}{r} 11, 22, 33, 66, 176 \\ \hline \end{array}$$

$$\therefore 176 = \text{L. C. M.}$$

$$(13) \begin{array}{r} 2) 12, 48, 26, 12, 16 \\ \hline 24, 13 \end{array}$$

$$\therefore 2 \times 24 \times 13 = 624 = \text{L. C. M.}$$

$$(14) \begin{array}{r} 42) 7, 15, 21, 28, 35, 42, 49 \\ \hline 7, \quad 2, 5, 1, 7 \end{array}$$

$$\therefore 42 \times 2 \times 5 \times 7 = 2940 = \text{L. C. M.}$$

$$(15) \begin{array}{r} 12) 3, 12, 16, 18, 24, 60 \\ \hline 1, \quad 4, 3, \quad 5 \end{array}$$

$$\therefore 12 \times 4 \times 3 \times 5 = 720 = \text{L. C. M.}$$

$$(16) \begin{array}{r} 84) 24, 35, 42, 84, 90 \\ \hline 7, \quad 1, 15 \end{array}$$

$$\therefore 84 \times 15 = 1260 = \text{L. C. M.}$$

$$(17) \begin{array}{r} 5) 6, 15, 17, 20, 35, 40 \\ \hline 3, 17, \quad 7, \quad 8 \end{array}$$

$$\therefore 5 \times 3 \times 17 \times 7 \times 8 = 14280 = \text{L. C. M.}$$

$$(18) \begin{array}{r} 8) 6, 16, 20, 24, 30, 32, 40 \\ \hline 3, 15, 4, \quad 5 \end{array}$$

$$\therefore 8 \times 15 \times 4 = 480 = \text{L. C. M.}$$

$$(19) \begin{array}{r} 36) 6, 24, 72, 108, 120 \\ \hline 2, \quad 3, \quad 10 \end{array}$$

$$\therefore 36 \times 3 \times 10 = 1080 = \text{L. C. M.}$$

$$(20) \begin{array}{r} 10) 2, 12, 25, 38, 95 \\ \hline 5, 12, 19 \end{array}$$

$$\therefore 10 \times 5 \times 19 = 950 = \text{L. C. M.}$$

$$(21) \begin{array}{r} 36) 6, 24, 72, 96, 108 \\ \hline 2, \quad 8, \quad 3 \end{array}$$

$$\therefore 36 \times 8 \times 3 = 864 = \text{L. C. M.}$$

$$(22) \begin{array}{r} 60) 6, 25, 36, 40, 54, 60, 90 \\ \hline 5, 3, 2, 9, 1, 3 \end{array}$$

$$\therefore 60 \times 5 \times 2 \times 9 = 5400 = \text{L. C. M.}$$

$$(23) \begin{array}{r} 24) 12, 16, 18, 24, 30, 36, 44, 50 \\ \hline 2, 3, 1, 3, 11, 25 \end{array}$$

$$\therefore 24 \times 2 \times 3 \times 11 \times 25 = 39600 = \text{L. C. M.}$$

$$(24) \begin{array}{r} 12) 2, 3, 6, 15, 18, 28, 42, 63 \\ \hline 5, 7, 7, 21, 3 \end{array}$$

$$\therefore 12 \times 5 \times 21 = 1260 = \text{L. C. M.}$$

$$(25) \ 24) \ 7, \ 18, \ 28, \ 32, \ 42, \ 48, \ 63, \ 72$$

$$7, \ 4, \ 21, \ 2, \ 21, \ 3$$

$$\therefore 24 \times 4 \times 21 = 2016 = \text{L. C. M.}$$

$$(26) \ 12) \ 18, \ 6, \ 3, \ 18, \ 36, \ 38, \ 48, \ 57$$

$$3, \ 18, \ 4, \ 19$$

$$\therefore 12 \times 3 \times 4 \times 19 = 2736 = \text{L. C. M.}$$

$$(27) \ 12) \ 4, \ 8, \ 3, \ 12, \ 18, \ 18, \ 20, \ 24, \ 36, \ 48, \ 63$$

$$5, \ 2, \ 3, \ 4, \ 21$$

$$\therefore 12 \times 5 \times 4 \times 21 = 5040 = \text{L. C. M.}$$

$$(28) \ 36) \ 3, \ 18, \ 24, \ 48, \ 54, \ 81, \ 72, \ 90, \ 108$$

$$9, \ 2, \ 10, \ 3$$

$$\therefore 36 \times 9 \times 10 = 3240 = \text{L. C. M.}$$

$$(29) \ 54) \ 3, \ 3, \ 27, \ 36, \ 54, \ 126, \ 180$$

$$2, \ 1, \ 7, \ 10$$

$$\therefore 54 \times 7 \times 10 = 3780 = \text{L. C. M.}$$

$$(30) \ 21) \ 7, \ 21, \ 28, \ 35, \ 49, \ 63, \ 77, \ 84$$

$$5, \ 7, \ 3, \ 11, \ 4$$

$$\therefore 21 \times 5 \times 7 \times 3 \times 11 \times 4 = 97020 = \text{L. C. M.}$$

$$(31) \ 12) \ 1, \ 2, \ 3, \ 4, \ 5, \ 6, \ 7, \ 8, \ 9, \ 10, \ 11, \ 12, \ 13$$

$$7, \ 2, \ 3, \ 5, \ 11, \ 1, \ 13$$

$$\therefore 12 \times 7 \times 2 \times 3 \times 5 \times 11 \times 13 = 360360 = \text{L. C. M.}$$

$$(32) \ 24) \ 3, \ 18, \ 18, \ 24, \ 30, \ 36, \ 48, \ 40$$

$$5, \ 3, \ 2, \ 5$$

$$\therefore 24 \times 3 \times 2 \times 5 = 720 = \text{L. C. M.}$$

$$(33) \ 72) \ 45, \ 18, \ 18, \ 24, \ 56, \ 72, \ 96, \ 108$$

$$5, \ 7, \ 1, \ 4, \ 3$$

$$\therefore 72 \times 5 \times 7 \times 4 \times 3 = 30240 = \text{L. C. M.}$$

$$(34) \ 36) \ 18, \ 18, \ 36, \ 48, \ 90, \ 108$$

$$1, \ 5, \ 35$$

$$\therefore 36 \times 35 = 1260 = \text{L. C. M.}$$

$$(35) \quad 24) 18, 24, 32, 40, 45, 60$$

$$\quad \underline{3, 1, 4, 5, 15, 5}$$

$$\therefore 24 \times 4 \times 15 = 1440 = \text{L. C. M.}$$

$$(36) \quad 36) 12, 28, 36, 45, 72, 108, 54$$

$$\quad \underline{7, 5, 2, 3}$$

$$\therefore 36 \times 7 \times 5 \times 2 \times 3 = 7560 = \text{L. C. M.}$$

$$(37) \quad 100) 15, 20, 45, 60, 75, 100, 125, 160$$

$$\quad \underline{9, 3, 3, 1, 5, 8}$$

$$\therefore 100 \times 9 \times 5 \times 8 = 36000 = \text{L. C. M.}$$

$$(38) \quad 48) 15, 20, 28, 36, 45, 72, 96, 144$$

$$\quad \underline{5, 7, 2, 3}$$

$$\therefore 48 \times 5 \times 7 \times 2 \times 3 = 10080 = \text{L. C. M.}$$

$$(39) \quad 72) 30, 40, 12, 56, 60, 75, 108, 144, 150$$

$$\quad \underline{5, 7, 5, 25, 3, 2, 25}$$

$$\therefore 72 \times 7 \times 3 \times 2 \times 25 = 75600 = \text{L. C. M.}$$

$$(40) \quad 48) 15, 24, 36, 56, 72, 80, 96, 100$$

$$\quad \underline{7, 3, 5, 2, 25}$$

$$\therefore 48 \times 7 \times 3 \times 2 \times 25 = 50400 = \text{L. C. M.}$$

EXERCISE XXIII., p. 37.

$$(1) \quad \frac{1}{5}, \frac{2}{5}, \frac{7}{10}, \frac{5}{8} = \frac{(30 \div 5) \times 1, (30 \div 3) \times 2, (30 \div 10) \times 7, (30 \div 6) \times 5}{30}$$

$$= \frac{6, 20, 21, 25}{30}.$$

$$(2) \quad \frac{2}{3}, \frac{1}{4}, \frac{1}{5}, \frac{5}{8} = \frac{(60 \div 3) \times 2, (60 \div 4) \times 3, (60 \div 5) \times 4, (60 \div 6) \times 5}{60}$$

$$= \frac{40, 45, 48, 50}{60}.$$

$$(3) \quad \frac{1}{5}, \frac{2}{5}, \frac{7}{9}, \frac{5}{18} = \frac{(720 \div 5) \times 4, (720 \div 3) \times 3, (720 \div 9) \times 7, (720 \div 18) \times 5}{720}$$

$$= \frac{576, 270, 560, 225}{720}.$$

- (4) $\frac{1}{2}, \frac{2}{12}, \frac{3}{20}, \frac{1}{12} = \frac{160, 135, 36, 20}{240}.$
- (5) $\frac{3}{11}, \frac{2}{22}, \frac{15}{17}, \frac{1}{24} = \frac{204, 306, 660, 17}{748}.$
- (6) $\frac{2}{8}, \frac{5}{24}, \frac{7}{15}, \frac{5}{32}, \frac{11}{28} = \frac{180, 100, 336, 75, 110}{480}.$
- (7) $\frac{5}{8}, \frac{1}{12}, \frac{21}{28}, \frac{5}{12}, \frac{1}{8} = \frac{880, 96, 372, 190, 57}{456}.$
- (8) $\frac{3}{8}, \frac{5}{16}, \frac{11}{24}, \frac{1}{7}, \frac{13}{14} = \frac{84, 70, 77, 32, 208}{224}.$
- (9) $\frac{2}{8}, \frac{1}{11}, \frac{14}{22}, \frac{17}{30}, \frac{16}{28}, \frac{1}{128} = \frac{132, 120, 140, 187, 96, 2}{330}.$
- (10) $\frac{11}{12}, \frac{2}{16}, \frac{13}{24}, \frac{2}{9}, \frac{13}{18}, \frac{7}{20} = \frac{660, 405, 130, 160, 520, 252}{720}.$
- (11) $\frac{1}{10}, \frac{5}{18}, \frac{7}{24}, \frac{8}{35}, \frac{9}{40}, \frac{11}{48} = \frac{168, 525, 490, 384, 378, 385}{1680}.$
- (12) $\frac{2}{18}, \frac{2}{25}, \frac{22}{50}, \frac{23}{48}, \frac{11}{24}, \frac{1}{240} = \frac{1350, 768, 1584, 1150, 825, 10}{2400}.$
- (13) $\frac{2}{7}, \frac{2}{28}, \frac{13}{20}, \frac{19}{48}, \frac{43}{80}, \frac{91}{100} = \frac{3600, 2700, 5460, 3325, 7224, 7644}{8400}.$
- (14) $\frac{2}{10}, \frac{16}{25}, \frac{3}{8}, \frac{19}{40}, \frac{51}{70}, \frac{93}{100} = \frac{1260, 896, 840, 665, 1020, 1302}{1400}.$
- (15) $\frac{5}{7}, \frac{6}{25}, \frac{17}{40}, \frac{11}{24}, \frac{19}{80}, \frac{91}{100} = \frac{9000, 2160, 5355, 3850, 4788, 11466}{12600}.$

EXERCISE XXIV., p. 38.

- (1) $\frac{1}{2} + \frac{2}{2} + \frac{3}{2} + \frac{4}{2} = \frac{1+2+3+4}{2} = \frac{10}{2} = 5.$
- (2) $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{6} = \frac{6+4+3+2}{12} = \frac{15}{12} = 1\frac{1}{4}.$
- (3) $\frac{2}{3} + \frac{4}{3} + \frac{4}{3} + \frac{5}{3} = \frac{40+45+48+50}{60} = \frac{183}{60} = 3\frac{3}{20} = 3\frac{1}{6}.$
- (4) $\frac{1}{2} + \frac{7}{8} + \frac{2}{3} + \frac{41}{8} + \frac{5}{9} = 4 + \frac{72+315+240+60+200}{360} = \frac{887}{360} = 2\frac{167}{360}.$
- (5) $\frac{2}{15} + \frac{1}{2} + \frac{11}{20} + \frac{3}{5} + \frac{5}{6} = \frac{135+120+132+144+200}{240} = \frac{731}{240} = 3\frac{11}{240}.$
- (6) $\frac{5}{12} + \frac{7}{15} + \frac{2}{20} + \frac{11}{25} = \frac{125+140+135+132}{300} = \frac{532}{300} = 1\frac{332}{300} = 1\frac{133}{75}.$

$$(7) 1\frac{1}{2} + \frac{1}{8} + 1\frac{1}{14} + \frac{12}{21} + \frac{13}{28} + \frac{21}{168} = 2 + \frac{84 + 21 + 12 + 152 + 78 + 31}{168} = 2\frac{42}{168} = 4\frac{1}{4}.$$

$$(8) 3\frac{1}{2} + \frac{11}{16} + \frac{17}{36} + 2\frac{13}{24} + \frac{21}{240} = 5 + \frac{120 + 165 + 204 + 130 + 31}{240} = 5\frac{650}{240} = 7\frac{17}{24}.$$

$$(9) 4\frac{5}{8} + \frac{8}{9} + 2\frac{5}{18} + \frac{7}{8} + 1\frac{1}{4} = 7 + \frac{120 + 128 + 45 + 126 + 36}{144} = 7\frac{455}{144} = 10\frac{22}{144}.$$

$$(10) 4\frac{3}{7} + 2\frac{11}{14} + \frac{16}{21} + \frac{9}{28} + \frac{1}{42} = 6 + \frac{36 + 66 + 64 + 27 + 2}{84} = 6\frac{195}{84} = 8\frac{17}{28} = 8\frac{3}{8}.$$

$$(11) 4\frac{1}{3} + 1\frac{3}{7} + 2\frac{5}{9} + \frac{19}{21} + \frac{19}{63} = 7 + \frac{21 + 27 + 35 + 48 + 19}{63} = 7\frac{150}{63} = 9\frac{10}{9} = 9\frac{1}{9}.$$

$$(12) 2\frac{2}{3} + 1\frac{3}{80} + 4\frac{1}{16} + 6\frac{1}{12} + 1\frac{1}{2} = 14 + \frac{160 + 9 + 15 + 20 + 120}{240} = 14\frac{324}{240} = 15\frac{84}{240} = 15\frac{7}{20}.$$

$$(13) \frac{1}{18} + \frac{12}{36} + \frac{5}{24} + \frac{13}{30} + 1\frac{239}{240} = 1 + \frac{15 + 228 + 50 + 104 + 239}{240} = 1\frac{636}{240} = 3\frac{159}{240} = 3\frac{13}{20}.$$

$$(14) (1\frac{2}{3} \text{ of } 4\frac{1}{2}) + \frac{5}{8} + 1\frac{1}{2} = 8 + \frac{5}{8} + 1\frac{1}{2} = 9 + \frac{25 + 6}{30} = 9\frac{31}{30} = 10\frac{1}{30}.$$

$$(15) (\frac{4}{11} \text{ of } 5\frac{1}{2}) + (3\frac{2}{3} \text{ of } 6) = 2 + 22 = 24.$$

$$(16) (7\frac{1}{4} \text{ of } 1\frac{1}{2}) + (\frac{2}{3} \text{ of } 5\frac{1}{2}) = \frac{29}{8} + \frac{21}{8} = \frac{87 + 31}{9} = \frac{118}{9} = 13\frac{1}{9}.$$

$$(17) \frac{1}{32} + \frac{5}{8} + \frac{5}{16} + 1\frac{1}{4} + 2\frac{1}{3} = 3 + \frac{3 + 60 + 30 + 24 + 32}{96} = 3\frac{149}{96} = 4\frac{53}{96}.$$

$$(18) \frac{1}{7} + 1\frac{1}{3} + \frac{3}{14} + 1\frac{1}{2} + \frac{6}{7} = 2 + \frac{6 + 14 + 9 + 21 + 36}{42} = 2\frac{86}{42} = 2\frac{43}{21} = 2\frac{1}{21}.$$

$$(19) \frac{7}{15} + 2\frac{1}{3} + \frac{4}{5} + (\frac{6}{7} \text{ of } \frac{7}{15}) + \frac{1}{25} = \frac{7}{15} + 2\frac{1}{3} + \frac{4}{5} + \frac{3}{5} + \frac{1}{25} = 2 + \frac{35 + 25 + 60 + 30 + 3}{75} = 2\frac{153}{75} = 4\frac{3}{25} = 4\frac{1}{25}.$$

$$(20) (\frac{4}{15} \text{ of } \frac{9}{15}) + (\frac{4}{11} \text{ of } 5\frac{1}{2}) + (\frac{3}{20} \text{ of } 6\frac{2}{3}) = \frac{3}{20} + 2 + 1 = 3\frac{3}{20}.$$

$$(21) (\frac{2}{3} \text{ of } 3\frac{3}{4}) + (\frac{11}{15} \text{ of } 3\frac{3}{4}) + \frac{11}{21} = \frac{3}{2} + 1 + \frac{11}{21} = 1 + \frac{63 + 22}{42} = 1\frac{85}{42} = 3\frac{1}{42}.$$

$$(22) \frac{1}{2} + \frac{1}{8} + 2\frac{1}{3} + 6\frac{1}{6} + 3 = 11 + \frac{15 + 5 + 10 + 6}{30} = 11\frac{36}{30} = 12\frac{6}{30} = 12\frac{1}{5}.$$

$$(23) \frac{12}{14} + (\frac{1}{2} \text{ of } 3\frac{3}{7}) + (\frac{1}{7} \text{ of } 5\frac{1}{2}) = \frac{12}{14} + \frac{23}{14} + \frac{16}{21} = \frac{39 + 69 + 32}{42} = \frac{140}{42} = 3\frac{14}{42} = 3\frac{1}{3}.$$

$$(24) \frac{11}{18} + (\frac{1}{3} \text{ of } 3\frac{3}{4} \text{ of } 9) + 6\frac{9}{20} = \frac{11}{18} + 4\frac{5}{4} + 6\frac{9}{20} = 6 + \frac{55 + 900 + 36}{80} = 6\frac{991}{80} = 18\frac{31}{80}.$$

$$(25) \frac{13}{24} + (\frac{1}{25} \text{ of } 4\frac{1}{3} \text{ of } 8\frac{6}{13}) + \frac{9}{18} = \frac{13}{24} + \frac{2}{3} + \frac{9}{18} = \frac{26 + 32 + 27}{48} = \frac{85}{48} = 1\frac{37}{48}.$$

$$(26) \frac{1}{12} + (\frac{7}{11} \text{ of } 5\frac{1}{2} \text{ of } 1\frac{1}{2} \text{ of } \frac{1}{11}) + \frac{2}{35} = \frac{1}{12} + 2 + \frac{2}{35} = 2 + \frac{28+28}{30} = \frac{241}{30} = 8\frac{1}{30} \\ = 8\frac{7}{75}.$$

$$(27) (\frac{1}{12} \text{ of } 3\frac{1}{2}) + (\frac{5}{8} \text{ of } 2\frac{1}{2}) + \frac{1}{12} = \frac{1}{8} + \frac{25}{12} + \frac{1}{12} = \frac{780+625+132}{300} = \frac{1537}{300} \\ = 5\frac{237}{300}.$$

$$(28) \frac{1}{12} + (\frac{1}{12} \text{ of } 3\frac{1}{2}) + (\frac{7}{11} \text{ of } 3\frac{1}{2} \text{ of } 1\frac{1}{2}) = \frac{1}{12} + \frac{1}{4} + \frac{1}{8} = \frac{16+15+168}{60} = \frac{199}{60} \\ = 3\frac{19}{60}.$$

$$(29) (\frac{5}{12} \text{ of } 3\frac{1}{2}) + \frac{1}{12} + (\frac{5}{11} \text{ of } 4\frac{1}{2} \text{ of } 3\frac{1}{2}) + \frac{1}{24} = \frac{5}{24} + \frac{1}{12} + \frac{95}{8} + \frac{1}{24} \\ = \frac{180+1017+1040+78}{144} = \frac{2215}{144} = 16\frac{11}{144}.$$

$$(30) (\frac{1}{12} \text{ of } 3\frac{1}{2} \text{ of } \frac{13}{12}) + \frac{2}{30} + (1\frac{2}{3} \text{ of } \frac{5}{7} \text{ of } \frac{7}{12}) = 1 + \frac{2}{30} + \frac{7}{12} = 1 + \frac{27+35}{60} \\ = 1\frac{62}{60} = 2\frac{31}{30} = 2\frac{1}{30}.$$

$$(31) (5\frac{1}{2} \text{ of } 3\frac{2}{11} \text{ of } 1\frac{1}{2} \text{ of } \frac{1}{24}) + 12\frac{2}{3} + \frac{256}{225} + (6\frac{2}{3} \text{ of } 7\frac{1}{2} \text{ of } \frac{1}{8} \text{ of } 6\frac{2}{12}) + (\frac{7}{10} \text{ of } 1\frac{1}{2}) \\ + 3\frac{1}{2} + \frac{641}{24} = \frac{1}{12} + 12\frac{2}{3} + \frac{256}{225} + \frac{115}{8} + \frac{7}{8} + 3\frac{2}{3} + \frac{641}{24} \\ = 15 + \frac{480+198+4096+20240+616+396+7051}{528} = 15\frac{23977}{528} \\ = 77\frac{241}{528} = 77\frac{1}{48}.$$

$$(32) (9\frac{2}{3} \text{ of } \frac{7}{11} \text{ of } \frac{1}{2} \text{ of } 4\frac{1}{2}) + (10\frac{5}{8} \text{ of } \frac{12}{10} \text{ of } \frac{7}{10}) + \frac{666}{25} + (10\frac{1}{2} \text{ of } 1\frac{7}{8} \text{ of } \frac{1}{8}) \\ = \frac{7}{8} + 7 + \frac{666}{25} + 8 = 15 + \frac{360+666}{25} = 15\frac{1026}{25} = 56\frac{1}{25}.$$

EXERCISE XXV., p. 39.

$$(1) \text{ i. } \frac{2}{3} - \frac{2}{3} = \frac{9-8}{12} = \frac{1}{12}; \text{ ii. } \frac{5}{6} - \frac{2}{3} = \frac{15-8}{18} = \frac{7}{18}; \text{ iii. } \frac{1}{2} - \frac{1}{8} = \frac{8-5}{40} = \frac{3}{40}.$$

$$(2) \text{ i. } \frac{1}{3} - \frac{2}{7} = \frac{7-6}{21} = \frac{1}{21}; \text{ ii. } 1\frac{7}{12} - \frac{3}{10} = 1\frac{14-9}{30} = 1\frac{5}{30} = 1\frac{1}{6};$$

$$\text{iii. } \frac{5}{7} - \frac{1}{3} = \frac{15-7}{21} = \frac{8}{21}.$$

$$(3) \text{ i. } 1\frac{1}{8} - \frac{2}{3} = 1\frac{1-4}{6} = \frac{2}{3} = \frac{1}{2}; \text{ ii. } \frac{7}{10} - \frac{2}{5} = \frac{7-4}{10} = \frac{3}{10};$$

$$\text{iii. } 1\frac{10}{11} - 1\frac{1}{22} = 1\frac{20-13}{22} = 1\frac{7}{22}.$$

$$(4) \text{ i. } 1\frac{2}{3} - \frac{7}{20} = 1\frac{15-14}{40} = 1\frac{1}{40}; \text{ ii. } 9\frac{2}{11} - 1\frac{2}{7} = 8\frac{14-22}{77} = 7\frac{62}{77};$$

$$\text{iii. } 3\frac{5}{8} - 2\frac{1}{2} = 1\frac{5-4}{8} = 1\frac{1}{8}.$$

$$(5) \text{ i. } 13 - \frac{2}{11} = 12\frac{11}{11}; \text{ ii. } 27\frac{1}{18} - 20\frac{5}{18} = 7\frac{1-10}{18} = 6\frac{8}{18} = 6\frac{4}{9};$$

$$\text{iii. } 4\frac{2}{7} - \frac{51}{175} = 4\frac{50-51}{175} = 3\frac{174}{175}.$$

$$(6) \text{ i. } 17\frac{5}{8} - 12\frac{3}{8} = 5\frac{25-32}{40} = 4\frac{32}{40}; \text{ ii. } 9\frac{1}{18} - \frac{11}{18} = 9\frac{7-11}{49} = 8\frac{15}{49};$$

$$\text{iii. } 65\frac{3}{8} - 48\frac{1}{4} = 17\frac{8-9}{86} = 16\frac{35}{86}.$$

$$(7) \text{ i. } 2\frac{1}{2} - (\frac{1}{12} \text{ of } 2\frac{5}{11} \text{ of } 3\frac{2}{3}) = 2\frac{1}{2} - \frac{1}{2} = 2\frac{4-15}{20} = 1\frac{9}{20};$$

$$\text{ii. } (\frac{5}{8} \text{ of } 1\frac{1}{12} \text{ of } 1\frac{1}{2}) - \frac{5}{12} = \frac{1}{3} - \frac{5}{12} = \frac{16-5}{12} = \frac{11}{12}.$$

$$(8) 3\frac{1}{2} - (\frac{10}{11} \text{ of } \frac{1}{4} \text{ of } 4\frac{1}{2}) = 3\frac{1}{2} - 2\frac{2}{11} = 1\frac{11-10}{55} = 1\frac{1}{55}.$$

$$(9) 19\frac{1}{12} - (2\frac{1}{2} + 4\frac{1}{3} + 1\frac{2}{3}) = 19\frac{1}{12} - 8\frac{2}{3} = 11\frac{2-9}{24} = 10\frac{17}{24}.$$

$$(10) (1\frac{5}{7} \text{ of } 3\frac{2}{3} \text{ of } \frac{7}{12}) - \frac{11}{12} = 4\frac{1}{12} - \frac{11}{12} = 4\frac{3-44}{48} = 3\frac{7}{12}.$$

$$(11) (\frac{2}{3} \text{ of } 1\frac{5}{8} \text{ of } 1\frac{1}{2} \text{ of } 1\frac{7}{8}) - (\frac{2}{3} \text{ of } \frac{25}{12} \text{ of } 2\frac{1}{2} \text{ of } \frac{2}{3}) = 1\frac{7}{8} - \frac{7}{8} = 1\frac{27-28}{86} = \frac{35}{86}.$$

$$(12) 2\frac{2}{3} - (\frac{2}{3} \text{ of } 5\frac{2}{3} \text{ of } \frac{7}{8}) + 2\frac{5}{8} + 2\frac{1}{2} + (\frac{27}{88} \text{ of } \frac{325}{88}) = 2\frac{2}{3} - 1\frac{2}{3} + 2\frac{5}{8} + 2\frac{1}{2} + \frac{5}{8} \\ = 5\frac{90-72+100+15+75}{120} = 5\frac{198}{120} = 6\frac{11}{12}.$$

$$(13) 20\frac{23}{24} - (\frac{11}{20} \text{ of } \frac{7}{8} \text{ of } 7\frac{2}{17} \text{ of } 2\frac{1}{7} \text{ of } 1\frac{1}{23}) = 20\frac{23}{24} - 6\frac{13}{24} = 14\frac{207-169}{234} \\ = 14\frac{38}{234} = 14\frac{19}{117}.$$

$$(14) 17\frac{7}{12} - 7\frac{2}{3} + (2\frac{2}{3} \text{ of } 6\frac{1}{2} \text{ of } \frac{1}{26} \text{ of } 1\frac{7}{11}) + (1\frac{1}{8} \text{ of } 1\frac{1}{2} \text{ of } \frac{1}{2}) = 17\frac{7}{12} - 7\frac{2}{3} + \frac{1}{3} \\ = 11\frac{68-52+91}{117} = 11\frac{107}{117} = 11\frac{24}{27}.$$

$$(15) 10\frac{3}{8} - \frac{11}{24} - 1\frac{7}{10} + (1\frac{1}{2} \text{ of } 1\frac{2}{3} \text{ of } \frac{5}{8}) + \frac{2}{3} + (\frac{2}{3} \text{ of } \frac{1}{2} \text{ of } 3\frac{2}{3} \text{ of } \frac{11}{12}) = 10\frac{3}{8} - \frac{11}{24} \\ - 1\frac{7}{10} + 1\frac{13}{12} + \frac{2}{3} + \frac{11}{21} = 10\frac{420-385-1823+1638+810+990}{1890} \\ = 10\frac{159}{1890} = 11\frac{29}{189}.$$

$$(16) (\frac{5}{7} \text{ of } 4\frac{1}{2} \text{ of } \frac{7}{12} \text{ of } 4\frac{1}{2} \text{ of } \frac{2}{26} \text{ of } 1\frac{1}{2}) + \frac{23}{28} + 10\frac{7}{12} + 17\frac{2}{3} - 3\frac{5}{14} = 1\frac{1}{12} + \frac{23}{28} \\ + 10\frac{7}{12} + 17\frac{2}{3} - 3\frac{5}{14} = 25\frac{21+161+196+126-120}{336} = 25\frac{384}{336} = 26\frac{1}{3}.$$

$$(17) 1\frac{10}{11} + \frac{2}{3} + 1\frac{5}{7} - (\frac{11}{12} \text{ of } \frac{62}{3} \text{ of } \frac{15}{28} \text{ of } \frac{2}{3}) = 1\frac{10}{11} + \frac{2}{3} + 1\frac{5}{7} - 1\frac{2}{3} \\ = 1\frac{100+70+75-63}{106} = 1\frac{182}{106} = 2\frac{11}{18}.$$

$$\begin{aligned}
 (18) \quad & \frac{13}{150} + \frac{2}{3} - (\frac{2}{15} \text{ of } \frac{2}{15} \text{ of } \frac{52}{27} \text{ of } \frac{25}{8} \text{ of } \frac{1}{2} \text{ of } \frac{48}{25}) + 3\frac{7}{8} + 1\frac{1}{2} + 9\frac{5}{8} + 3\frac{5}{24} \\
 & - (\frac{2}{3} \text{ of } \frac{152}{3} \text{ of } \frac{1}{3}) - 3\frac{5}{24} = \frac{13}{150} + \frac{2}{3} - 2\frac{5}{12} + 3\frac{7}{8} + 1\frac{1}{2} + 9\frac{5}{8} + 3\frac{5}{24} - 7\frac{13}{20} \\
 & - 3\frac{5}{24} = 4 \frac{52 + 320 - 200 + 420 + 120 + 400 + 100 - 312 - 75}{480} \\
 & = 4\frac{825}{480} = 5\frac{25}{16}.
 \end{aligned}$$

$$\begin{aligned}
 (19) \quad & (\frac{25}{15} \text{ of } \frac{123}{15} \text{ of } \frac{47}{50} \text{ of } \frac{416}{21} \text{ of } \frac{54}{7} \text{ of } \frac{5}{2} \text{ of } \frac{49}{155} \text{ of } \frac{1}{15}) \\
 & - (6\frac{2}{7} + 2\frac{1}{7} \text{ of } 4\frac{2}{3} + \frac{5}{14} + 1\frac{5}{7}) = 45\frac{1}{2} - (6\frac{2}{7} + 10 + \frac{5}{14} + 1\frac{5}{7}) = 45\frac{1}{2} - 18\frac{13}{14} \\
 & = 27\frac{7-13}{14} = 26\frac{8}{14} = 26\frac{4}{7}.
 \end{aligned}$$

$$\begin{aligned}
 (20) \quad & 9\frac{2}{3} + 1\frac{8}{27} + \frac{7}{3} - (\frac{72}{5} \text{ of } \frac{17}{15} \text{ of } \frac{8}{5} \text{ of } \frac{81}{88}) + \frac{11}{20} + \frac{7}{24} + (\frac{5}{3} \text{ of } \frac{347}{12} \text{ of } \frac{27}{16} \text{ of } \frac{49}{33}) \\
 & - 2\frac{2}{3} + 6\frac{2}{3} + 2\frac{1}{18} = 9\frac{2}{3} + 1\frac{8}{27} + \frac{7}{3} - 14\frac{2}{3} + \frac{11}{20} + \frac{7}{24} + 75 - (2\frac{2}{3} + 6\frac{2}{3} + 2\frac{1}{18}) \\
 & = 61 \frac{180 + 80 + 210 - 108 + 99 + 35 - (225 + 60 + 15)}{270} = 61\frac{126}{270} \\
 & = 61\frac{98}{135}.
 \end{aligned}$$

EXERCISE XXVI., p. 40.

$$(1) \text{ i. } \frac{7}{8} \times \frac{12}{12} \times \frac{12}{7} = \frac{3}{2} \times 1\frac{1}{2}; \quad \text{ii. } \frac{6}{12} \times \frac{28}{24} \times \frac{14}{3} = \frac{8}{3} = 2\frac{2}{3};$$

$$\text{iii. } \frac{6}{15} \times \frac{10}{8} \times \frac{27}{20} = \frac{4}{5}.$$

$$(2) \text{ i. } \frac{72}{7} \times \frac{14}{12} \times \frac{5}{12} = 5; \quad \text{ii. } \frac{3}{8} \times \frac{9}{1} \times \frac{4}{15} = \frac{9}{10}; \quad \text{iii. } \frac{25}{12} \times \frac{9}{20} \times \frac{8}{5} = \frac{9}{5} = 1\frac{4}{5}.$$

$$(3) \text{ i. } \frac{57}{13} \times \frac{15}{17} \times \frac{17}{8} = \frac{85}{13} = 7\frac{4}{13}; \quad \text{ii. } \frac{5}{16} \times \frac{23}{20} \times \frac{4}{3} \times \frac{52}{23} = \frac{13}{12} = 1\frac{1}{12}.$$

$$\text{iii. } \frac{77}{24} \times \frac{3}{10} \times \frac{48}{7} \times \frac{25}{22} = \frac{15}{2} = 7\frac{1}{2}.$$

$$4) \text{ i. } \frac{15}{22} \times \frac{12}{20} \times \frac{25}{18} \times \frac{14}{25} = 5; \quad \text{ii. } \frac{2}{10} \times \frac{3}{5} \times \frac{22}{5} \times \frac{15}{11} \times \frac{5}{2} = 2 = 1\frac{1}{2};$$

$$\text{iii. } \frac{24}{7} \times \frac{5}{8} \times \frac{21}{11} \times \frac{3}{2} \times \frac{11}{5} \times \frac{7}{14} = 2\frac{1}{2} = 2\frac{1}{2}.$$

$$5) \text{ i. } \frac{2}{33} \times \frac{16}{11} \times \frac{7}{2} \times \frac{28}{2} \times \frac{5}{12} \times \frac{3}{10} = 4;$$

$$\text{ii. } \frac{28}{25} \times \frac{5}{12} \times \frac{14}{2} \times \frac{2}{7} \times \frac{21}{4} \times \frac{12}{7} = 2\frac{1}{2} = 2\frac{1}{2}.$$

$$6) \text{ i. } \frac{2}{16} \times \frac{22}{2} \times \frac{12}{7} \times \frac{2}{2} \times \frac{55}{22} \times \frac{5}{22} = 10\frac{5}{7};$$

$$\text{ii. } \frac{10}{22} \times \frac{11}{2} \times \frac{4}{5} \times \frac{25}{22} \times \frac{7}{15} \times \frac{12}{2} \times \frac{8}{7} \times \frac{55}{5} \times \frac{2}{4} \times \frac{1}{22} = 11\frac{1}{12}.$$

$$7) \text{ i. } \frac{24}{15} \times \frac{22}{12} \times \frac{5}{12} \times \frac{25}{22} \times \frac{20}{21} \times \frac{121}{170} \times \frac{2}{2} \times \frac{5}{12} \times \frac{50}{22} \times \frac{2}{50} = 21 = 6\frac{1}{2};$$

$$\text{ii. } \frac{2}{2} \times \frac{12}{25} \times \frac{25}{12} \times \frac{21}{22} \times \frac{9}{25} \times \frac{175}{22} \times \frac{2}{12} \times \frac{10}{7} \times \frac{25}{2} = 16\frac{1}{2} = 16\frac{1}{2}.$$

$$8) \text{ i. } \frac{2}{2} \times \frac{12}{2} \times \frac{5}{14} \times \frac{10}{2} \times \frac{105}{11} \times \frac{12}{12} \times \frac{20}{12} \times \frac{72}{10} \times \frac{5}{14} \times \frac{24}{12} \times \frac{22}{22} \times \frac{11}{22} = 20;$$

$$\text{ii. } \frac{28}{12} \times \frac{3}{12} \times \frac{21}{20} \times \frac{54}{11} \times \frac{7}{8} \times \frac{47}{20} \times \frac{5}{4} \times \frac{43}{7} \times \frac{25}{14} \times \frac{22}{3} \times \frac{3}{4} \times \frac{21}{24} \times \frac{13}{3} \\ = \frac{324}{11} = 21\frac{3}{11}.$$

EXERCISE XXVII., p. 41.

$$\text{(1) i. } 3 \div \frac{3}{4} = \frac{3}{1} \times \frac{4}{3} = 4; \quad \text{ii. } 2\frac{1}{2} + 1\frac{3}{4} = \frac{9}{4} \times \frac{4}{7} = \frac{9}{7} = 1\frac{2}{7};$$

$$\text{iii. } 1\frac{1}{2} \div 1\frac{1}{2} = \frac{3}{2} \times \frac{2}{3} = \frac{2}{2}; \quad \text{iv. } \frac{3}{4} \div 3 = \frac{3}{4} \times \frac{1}{3} = \frac{1}{4};$$

$$\text{v. } \frac{2}{3} + \frac{4}{3} = \frac{6}{3} \times \frac{5}{4} = \frac{5}{2}; \quad \text{vi. } 2\frac{2}{3} + 1\frac{1}{2} = \frac{13}{3} \times \frac{2}{4} = \frac{13}{2} = 6\frac{1}{2};$$

$$\text{vii. } \frac{35}{24} + \frac{7}{16} = \frac{35}{24} \times \frac{13}{7} = \frac{5}{2} = 2\frac{1}{2}; \quad \text{viii. } 5\frac{1}{3} + 2\frac{2}{3} = \frac{13}{3} \times \frac{3}{3} = 2.$$

$$\text{(2) i. } 6\frac{2}{3} + 10 = \frac{20}{3} \times \frac{1}{10} = \frac{2}{3}; \quad \text{ii. } 8\frac{1}{2} + 3\frac{1}{2} = \frac{16}{2} \times \frac{3}{7} = \frac{24}{7} = 3\frac{3}{7};$$

$$\text{iii. } 15\frac{5}{8} + 18\frac{3}{4} = \frac{125}{8} \times \frac{4}{7} = \frac{125}{14} = 8\frac{9}{14}; \quad \text{iv. } 23 + 3\frac{2}{3} = \frac{23}{1} \times \frac{7}{23} = 7;$$

$$\text{v. } 9\frac{4}{9} + 1\frac{5}{12} = \frac{85}{9} \times \frac{13}{12} = \frac{1105}{108} = 10\frac{5}{12}; \quad \text{vi. } 13\frac{1}{8} + 6\frac{3}{10} = \frac{105}{8} \times \frac{10}{63} = \frac{25}{3} = 8\frac{1}{3};$$

$$\text{vii. } 21\frac{3}{12} + 16\frac{21}{28} = \frac{273}{12} \times \frac{23}{19} = \frac{244}{19} = 12\frac{12}{19};$$

$$\text{viii. } 13\frac{25}{28} + 7\frac{13}{14} = \frac{185}{28} \times \frac{14}{11} = \frac{259}{11} = 23\frac{6}{11}.$$

$$1) \text{ i. } \frac{5}{12} \times \frac{12}{15} \times \frac{15}{18} \times \frac{1}{3} = \frac{1}{2}; \quad \text{ii. } \frac{11}{8} \times \frac{2}{22} \times \frac{2}{7} \times \frac{14}{2} = \frac{1}{2};$$

$$\text{iii. } \frac{24}{11} \times \frac{22}{25} \times \frac{55}{12} \times \frac{25}{22} = \frac{12}{5} = 2\frac{2}{5}; \quad \text{iv. } \frac{29}{2} \times \frac{27}{10} \times \frac{25}{27} \times \frac{22}{15} = \frac{29}{5} = 5\frac{4}{5}.$$

$$4) \text{ i. } \frac{2}{7} \times \frac{21}{4} \times \frac{11}{12} \times \frac{18}{5} \times \frac{9}{22} = \frac{9}{10}; \quad \text{ii. } \frac{25}{2} \times \frac{11}{20} \times \frac{21}{24} \times \frac{48}{55} \times \frac{1}{7} = \frac{2}{5};$$

$$\text{iii. } \frac{7}{11} \times \frac{22}{17} \times \frac{25}{12} \times \frac{51}{24} \times \frac{2}{15} \times \frac{9}{7} = \frac{45}{11} = 4\frac{1}{11};$$

$$\text{iv. } \frac{22}{22} \times \frac{143}{2} \times \frac{78}{11} \times \frac{1}{10} \times \frac{54}{27} \times \frac{23}{26} \times \frac{50}{21} = \frac{220}{21} = 10\frac{10}{21}.$$

$$5) \text{ i. } \frac{18}{7} \times \frac{202}{45} \times \frac{57}{10} \times \frac{167}{22} \times \frac{12}{23} \times \frac{25}{22} \times \frac{5}{21} \times \frac{27}{221} \times \frac{1}{11} = \frac{27}{27} = 1;$$

$$\text{ii. } \frac{22}{2} \times \frac{55}{12} \times \frac{2}{2} \times \frac{222}{122} \times \frac{2}{24} \times \frac{52}{12} \times \frac{153}{202} \times \frac{12}{15} \times \frac{45}{22} = \frac{1}{2}.$$

$$(6) \text{ i. } \frac{24}{12} \times \frac{121}{12} \times \frac{142}{15} \times \frac{222}{14} \times \frac{200}{212} \times \frac{12}{22} \times \frac{11}{24} \times \frac{147}{222} \times \frac{12}{22} \times \frac{27}{40} \times \frac{2}{25} = \frac{11}{15} = 7\frac{2}{15};$$

$$\text{ii. } \frac{18}{4\frac{1}{2}} = \frac{18}{\frac{9}{2}} \times \frac{2}{2} = 4;$$

$$\text{iii. } \frac{72}{12\frac{3}{4}} = \frac{72}{\frac{51}{4}} \times \frac{4}{4} = \frac{96}{51} = 1\frac{1}{2}.$$

$$(7) \text{ i. } \frac{17\frac{1}{2}}{2\frac{2}{3}} = \frac{\overset{4}{\cancel{32}}}{\cancel{3}} \times \frac{5}{\cancel{12}} = \frac{20}{3} = 6\frac{2}{3}; \quad \text{ii. } \frac{16\frac{2}{3}}{4\frac{4}{15}} = \frac{\overset{19}{\cancel{152}}}{\cancel{3}} \times \frac{\overset{5}{\cancel{15}}}{\cancel{8}} = \frac{25}{2} = 12\frac{1}{2};$$

$$\text{iii. } \frac{1\frac{1}{2}}{3\frac{7}{18}} = \frac{\overset{4}{\cancel{12}}}{\cancel{3}} \times \frac{\overset{2}{\cancel{18}}}{\cancel{54}} = \frac{4}{15}; \quad \text{iv. } \frac{10\frac{5}{12}}{1\frac{1}{12}} = \frac{\overset{5}{\cancel{15}}}{\cancel{1}} \times \frac{\overset{2}{\cancel{12}}}{\cancel{12}} = 10;$$

$$\text{v. } \frac{5\frac{2}{3}}{5\frac{2}{3}} = \frac{\overset{7}{\cancel{35}}}{\cancel{11}} \times \frac{\overset{5}{\cancel{55}}}{\cancel{6}} = \frac{25}{6} = 4\frac{1}{6}; \quad \text{vi. } \frac{3\frac{1}{2}}{8\frac{2}{5}} = \frac{\overset{5}{\cancel{35}}}{\cancel{8}} \times \frac{\overset{3}{\cancel{24}}}{\cancel{2}} = \frac{15}{8};$$

$$\text{vii. } \frac{18\frac{2}{3}}{4\frac{2}{31}} = \frac{\overset{3}{\cancel{123}}}{\cancel{4}} \times \frac{\overset{3}{\cancel{31}}}{\cancel{80}} = \frac{9}{2} = 4\frac{1}{2}.$$

$$(8) \text{ i. } \frac{\frac{9}{12}}{\frac{2}{3}} = \frac{\overset{3}{\cancel{9}}}{\cancel{12}} \times \frac{\overset{3}{\cancel{3}}}{\cancel{2}} = \frac{3}{2}; \quad \text{ii. } \frac{2\frac{5}{12}}{\frac{11}{12}} = \frac{\overset{3}{\cancel{23}}}{\cancel{11}} \times \frac{\overset{6}{\cancel{12}}}{\cancel{11}} = \frac{12}{11} = 1\frac{1}{11};$$

$$\text{iii. } \frac{3\frac{21}{27}}{\frac{27}{81}} = \frac{\overset{4}{\cancel{324}}}{\cancel{27}} \times \frac{\overset{7}{\cancel{81}}}{\cancel{27}} = \frac{28}{3} = 9\frac{1}{3}; \quad \text{iv. } \frac{4\frac{5}{27}}{2\frac{1}{4}} = \frac{\overset{17}{\cancel{415}}}{\cancel{27}} \times \frac{\overset{4}{\cancel{36}}}{\cancel{114}} = \frac{17}{9} = 1\frac{8}{9};$$

$$\text{v. } \frac{4\frac{52}{121}}{1\frac{21}{121}} = \frac{\overset{3}{\cancel{273}}}{\cancel{55}} \times \frac{\overset{11}{\cancel{121}}}{\cancel{132}} = \frac{22}{10} = 2\frac{1}{5}; \quad \text{vi. } \frac{1\frac{12}{188}}{1\frac{7}{188}} = \frac{\overset{3}{\cancel{132}}}{\cancel{188}} \times \frac{\overset{5}{\cancel{188}}}{\cancel{188}} = \frac{15}{188};$$

$$\text{vii. } \frac{12\frac{2}{3}}{1\frac{12}{32}} = \frac{\overset{7}{\cancel{84}}}{\cancel{5}} \times \frac{\overset{7}{\cancel{35}}}{\cancel{64}} = \frac{49}{8} = 6\frac{1}{8}; \quad \text{viii. } \frac{5\frac{12}{248}}{2\frac{12}{248}} = \frac{\overset{17}{\cancel{152}}}{\cancel{4}} \times \frac{\overset{7}{\cancel{48}}}{\cancel{13}} = \frac{119}{13} = 9\frac{2}{13}.$$

$$(9) \text{ i. } \frac{38}{2\frac{1}{2} \text{ of } 2\frac{1}{2}} = \frac{\overset{2}{\cancel{38}}}{\cancel{1}} \times \frac{\overset{7}{\cancel{7}}}{\cancel{11}} \times \frac{\overset{5}{\cancel{5}}}{\cancel{11}} = 7;$$

$$\text{ii. } \frac{12\frac{2}{3} \text{ of } 1\frac{2}{3}}{3\frac{2}{3} \text{ of } 1\frac{2}{3}} = \frac{\overset{2}{\cancel{28}}}{\cancel{3}} \times \frac{\overset{27}{\cancel{27}}}{\cancel{18}} \times \frac{\overset{3}{\cancel{3}}}{\cancel{18}} \times \frac{\overset{2}{\cancel{2}}}{\cancel{2}} = \frac{27}{8} = 3\frac{3}{8}$$

$$\text{iii. } \frac{27\cancel{3}\cancel{4}}{2\cancel{4}\cancel{8}} \text{ of } 1\frac{1}{4} = \frac{\cancel{3}\cancel{4}}{\cancel{2}\cancel{4}} \times \frac{\cancel{4}\cancel{5}}{\cancel{1}\cancel{2}} \times \frac{7}{\cancel{1}\cancel{5}} = \frac{21}{2} = 10\frac{1}{2};$$

$$\text{iv. } \frac{8\frac{2}{3} \text{ of } 1\frac{4}{21}}{2\frac{5}{14} \text{ of } 1\frac{1}{22}} = \frac{\frac{49}{3} \times \frac{25}{21} \times \frac{14}{22} \times \frac{22}{25}}{\frac{3}{5}} = \frac{8}{3} = 2\frac{2}{3};$$

$$v. \frac{\frac{136}{216} \text{ of } \frac{23}{37}}{\frac{216}{37} \text{ of } \frac{1}{33}} = \frac{\frac{7}{27} \times \frac{5}{11} \times \frac{3}{20} \times \frac{33}{25}}{\frac{2}{10}} = \frac{3}{2} = 1\frac{1}{2};$$

$$\text{vi. } \frac{\frac{24}{17} \text{ of } \frac{24}{21}}{\frac{1}{29} \text{ of } \frac{1}{51}} = \frac{24}{17} \times \frac{24}{21} \times \frac{29}{1} \times \frac{51}{1} = \frac{29}{7} = 3\frac{2}{7}.$$

$$1) \text{ i. } \frac{5\cancel{1}\cancel{7}}{3\cancel{7}} \text{ of } \frac{7\cancel{2}\cancel{7}}{8\cancel{3}} \text{ of } \frac{5\cancel{5}}{4\cancel{3}\cancel{9}} = \frac{\cancel{1}\cancel{7}\cancel{7}}{\cancel{3}\cancel{7}} \times \frac{\cancel{2}\cancel{7}\cancel{7}}{\cancel{4}\cancel{3}} \times \frac{\cancel{5}\cancel{9}}{\cancel{8}} \times \frac{7}{\cancel{2}\cancel{2}} \times \frac{\cancel{3}}{\cancel{2}\cancel{5}} \times \frac{\cancel{2}\cancel{7}}{\cancel{1}\cancel{1}\cancel{8}} = \frac{2\cancel{7}}{1\cancel{6}} = 2\frac{1}{6};$$

$$\text{ii. } \frac{20}{3\frac{1}{3} + 7\frac{7}{9}} = \frac{20}{11\frac{1}{3}} = \frac{20}{1} \times \frac{9}{100} = \frac{9}{5} = 1\frac{4}{5};$$

iii. $\frac{47}{\frac{211}{21} + 5\frac{5}{6} + 1\frac{5}{7}} = \frac{47}{10\frac{1}{14}} = \frac{47}{\frac{141}{14}} = 4\frac{2}{3}$; iv. $\frac{12\frac{3}{4}}{1\frac{5}{12} + 1\frac{9}{24} + \frac{17}{36}} = \frac{12\frac{3}{4}}{3\frac{19}{36}} = \frac{8}{5}$.

1) i. $\frac{7\frac{5}{8} + 22\frac{13}{24}}{16\frac{7}{11} - 5\frac{2}{3}} = \frac{30\frac{1}{4}}{10\frac{32}{33}} = 2\frac{3}{4}$; ii. $\frac{22\frac{3}{4} - 17\frac{11}{12}}{\frac{15}{16} \text{ of } 5\frac{1}{4} \text{ of } 3\frac{1}{5}} = \frac{4\frac{5}{6}}{\frac{15}{16} \text{ of } 5\frac{1}{4} \text{ of } 3\frac{1}{5}} = \frac{5}{16}$;

$$\text{iii. } \frac{35\frac{7}{12} - 2\frac{11}{16}}{7\frac{11}{16} + \frac{1}{8} + 21\frac{5}{12} + 3\frac{5}{8}} = \frac{32\frac{43}{48}}{32\frac{43}{48}} = 1;$$

$$\text{iv. } \frac{\frac{5}{13} + \frac{43}{89} + \frac{11}{35} + \frac{7}{27}}{\frac{211}{13} \text{ of } \frac{88}{111} \text{ of } \frac{351}{2} \text{ of } \frac{1}{2}} = \frac{5 \frac{7}{27}}{\frac{211}{13} \text{ of } \frac{88}{111} \text{ of } \frac{351}{2} \text{ of } \frac{1}{2}} = \frac{13}{22}$$

2) i. $\frac{\frac{4}{6-\frac{4}{2+\frac{2}{3}}}}{\frac{5}{7+\frac{5}{3+\frac{2}{3}}}} = \frac{\frac{4}{6-1\frac{1}{2}}}{\frac{5}{7+1\frac{1}{3}}} = \frac{\frac{4}{4\frac{1}{2}}}{\frac{5}{8\frac{1}{3}}} = \frac{\frac{8}{9}}{\frac{5}{8}} = 1\frac{2}{15}$

$$\text{ii. } \frac{1\frac{1}{2} + \frac{4}{5} + 2\frac{1}{3}}{5\frac{1}{2} + 7\frac{1}{12} + \frac{9}{20}} + \frac{\frac{9}{11} + \frac{7}{22}}{\frac{7}{4} \text{ of } 1\frac{3}{4} \text{ of } 2\frac{3}{11}} = \frac{4\frac{11}{15}}{12\frac{11}{15}} \div \frac{1\frac{8}{22}}{\frac{25}{11}} = \frac{2}{3}$$

(13) i. $\frac{5\frac{1}{2} \text{ of } 4\frac{1}{7} \text{ of } \frac{14}{12}}{4\frac{2}{5} \text{ of } 3\frac{2}{3} \text{ of } 1\frac{1}{14}} \times \frac{\frac{1}{2} + \frac{3}{4} - \frac{1}{8}}{\frac{1}{4} - (\frac{1}{8} \text{ of } 2\frac{2}{3})} = \frac{5\frac{1}{2} \text{ of } 4\frac{1}{7} \text{ of } \frac{14}{12}}{4\frac{2}{5} \text{ of } 3\frac{2}{3} \text{ of } 1\frac{1}{14}} \times \frac{\frac{13}{8}}{\frac{1}{16}} = \frac{91}{6} = 15\frac{1}{6};$

$$\text{ii. } \frac{1 + \frac{1}{2} + \frac{1}{4}}{2 - \frac{1}{2} \text{ of } \frac{1}{4}} = \frac{1 + \frac{1}{2} + \frac{1}{4}}{2 - \frac{1}{2} \times \frac{1}{4}} = \frac{1 + \frac{1}{2} + \frac{1}{4}}{2 - \frac{1}{8}} = \frac{1 + \frac{1}{2} + \frac{1}{4}}{\frac{15}{8}} = \frac{1 + \frac{1}{2} + \frac{1}{4}}{1} = 6;$$

$$\text{iii. } \frac{8}{20 - \frac{4}{6 - \frac{3}{8} + \frac{1}{8}}} + \frac{7}{3 + \frac{10}{15 - \frac{12\frac{1}{2}}{1\frac{1}{2}} - 1\frac{1}{2}}} = \frac{8}{20 - \frac{4}{6 - \frac{4}{10}}} + \frac{7}{3 + \frac{10}{15 - \frac{10}{25}}} = \frac{8}{20 - \frac{4}{2}} + \frac{7}{3 + \frac{10}{2\frac{1}{2}}} = \frac{8}{18\frac{1}{2}} \div \frac{7}{7} = \frac{8}{1} \times \frac{3}{55} = \frac{24}{55}.$$

$$(14) \text{ i. } \frac{5}{7-\frac{9}{3-\frac{1}{2}}} + \frac{5}{16-\frac{11}{2-\frac{1}{3}}} = \frac{5}{7-\frac{9}{2\frac{1}{2}}} + \frac{5}{16-\frac{11}{1\frac{2}{3}}} = \frac{5}{7-4} \\ + \frac{5}{16-6} = \frac{5}{3} + \frac{5}{10} = 2\frac{1}{6};$$

ii. $\frac{(3\frac{3}{4} \text{ of } \frac{7}{16})}{5(\frac{6}{7} \text{ of } \frac{2}{3})} + \frac{7}{1\frac{1}{2}} \left(\frac{1\frac{1}{2} \text{ of } 3\frac{1}{2}}{\frac{5}{12} \text{ of } 4\frac{1}{2}} \right) = \frac{9}{1} \times \frac{2^5}{7} \times \frac{7}{16} \times \frac{1}{2} \times \frac{1}{2} \times \frac{5}{2} \times \frac{7}{4} \times \frac{6}{7} \times \frac{5}{2}$
 $\times \frac{2}{15} \times \frac{5}{12} \times \frac{24}{5} = \frac{3}{8}.$

$$(15) \text{ i. } \frac{6\frac{2}{3} \text{ of } \frac{3}{10}}{1\frac{7}{9} \text{ of } \frac{1}{2} + 3\frac{4}{7}} \text{ of } \frac{5}{18} \text{ of } \frac{6\frac{1}{2} \text{ of } \frac{9}{32}}{2\frac{1}{3} \text{ of } 2\frac{2}{3}} \text{ of } \frac{3\frac{1}{2}}{6\frac{1}{8}} = \frac{20}{3} \times \frac{3}{10} \times \frac{7}{12} \times \frac{2}{1} \times \frac{2^4}{7} \times \frac{5}{18} \\ \times \frac{5^5}{9} \times \frac{9}{32} \times \frac{9}{25} \times \frac{3}{8} \times \frac{7}{3} \times \frac{8}{49} = \frac{3}{7};$$

$$\begin{aligned} \text{ii. } & \left(\frac{6\frac{1}{2} + 3\frac{1}{2} - \frac{1}{2}}{\frac{5}{8} + 7\frac{1}{13} - \frac{1}{80}} \text{ of } \frac{4\frac{1}{2} - 2\frac{3}{4}}{6\frac{1}{2} + 2\frac{1}{4}} \right) + \left(\frac{7 + \frac{1}{2}}{\frac{5}{7} - \frac{1}{2}} \text{ of } \frac{25}{968} \right) = \left(\frac{9\frac{7}{8}}{12\frac{4}{15}} \text{ of } \frac{19}{8\frac{1}{4}} \right) \\ & \div \left(\frac{13}{\frac{3}{14}} \text{ of } \frac{25}{968} \right) = \frac{115}{18} \times \frac{15}{184} \times \frac{13}{7} \times \frac{14}{121} \times \frac{14}{13} \times \frac{8}{14} \times \frac{968}{25} = \frac{2}{3} = 1\frac{1}{3} \end{aligned}$$

$$(16) \text{ i. } \frac{1}{240 + \frac{4320}{89}} \times \frac{2268}{1 + \frac{8}{\frac{1}{\frac{1}{2} + \frac{1}{3} + \frac{1}{4}}}}} = \frac{1}{240 + \frac{4320}{144}} \times \frac{2268}{1 + \frac{8}{1\frac{3}{4}}} = \frac{1}{270} \times \frac{2268}{\frac{5}{42}} = \frac{1}{270} \times \frac{2268}{1} \times \frac{5}{42} = 1.$$

$$\begin{aligned}
 & \frac{10}{25 - \frac{7}{\frac{2}{3} + \frac{4}{25}}} + \frac{9}{8\frac{1}{2} - \frac{5}{\frac{3}{4} - \frac{2}{3}}} = \frac{10}{\frac{25 - 12\frac{1}{2}}{\frac{10}{81}}} + \frac{9}{8\frac{1}{2} - \frac{5}{\frac{1}{2}}} = \frac{10}{\frac{12\frac{1}{2}}{\frac{10}{81}}} + \frac{9}{8\frac{1}{2} - 1\frac{1}{2}} \\
 & \frac{10}{1 - \frac{1}{\frac{81}{5} - \frac{2}{3}}} + \frac{9}{4 - \frac{3}{\frac{2}{3} + \frac{1}{2}}} = \frac{10}{1 - \frac{1}{\frac{1}{5}}} + \frac{9}{1 - \frac{1}{\frac{7}{6}}} = \frac{10}{\frac{4}{5}} + \frac{9}{\frac{1}{6}} \\
 & = 10 \times \frac{5}{4} \times \frac{51}{10} \times \frac{5}{3} \times \frac{1}{3} \times \frac{1}{5} = \frac{5}{2}.
 \end{aligned}$$

$$\begin{aligned}
 8) \quad & \frac{2 \text{ of } 1\frac{3}{4} \text{ of } 12}{3 + \frac{5}{\frac{1}{2} \text{ of } 10}} + \frac{6\frac{3}{4}}{3 - \frac{6}{(\frac{1}{3} \times \frac{5}{6} \times 3)}} = \frac{2 \text{ of } 1\frac{3}{4} \text{ of } 12}{4} + \frac{6\frac{3}{4}}{3 - 6\frac{3}{4}} \\
 & = \frac{2 \times 1\frac{3}{4} \times 12}{4} + \frac{6\frac{3}{4}}{\frac{3}{4}} = 10 + 11 = 21.
 \end{aligned}$$

$$\begin{aligned}
 9) \quad & \frac{8}{\frac{1}{2} + \frac{\frac{5}{12}}{11}} + \frac{8}{1\frac{5}{7} + \frac{25\frac{5}{7}}{107}} = \frac{8}{\frac{1}{2} + \frac{5}{132}} + \frac{8}{1\frac{5}{7} + \frac{25\frac{5}{7}}{90}} = \frac{8}{\frac{137}{132}} + \frac{8}{2} \\
 & 10 - \frac{8}{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}} = 300 - \frac{8}{\frac{1}{5} + \frac{1}{3} + \frac{1}{7}} \\
 & = 10\frac{2}{15} + 4 = 14\frac{2}{15}.
 \end{aligned}$$

$$\begin{aligned}
 1) \quad & \frac{\frac{1}{2} + \frac{1}{3} + \frac{11}{13}}{\frac{1}{2} + \frac{5}{3} + \frac{11}{13}} \text{ of } \frac{\frac{5}{3} \text{ of } 2\frac{1}{2} + 1\frac{11}{13}}{\frac{19}{37} \text{ of } 4\frac{5}{8} + 9\frac{1}{4}} + \frac{7}{4 - \frac{13}{\frac{1}{2} + \frac{1}{3} + \frac{1}{4}}} = \frac{32}{2} \text{ of } \frac{\frac{5}{3} \text{ of } 2\frac{1}{2} \times \frac{24}{37}}{\frac{19}{37} \text{ of } 4\frac{5}{8} \times \frac{4}{37}} \\
 & + \frac{7}{4 - \frac{1}{3}} = \frac{32}{2} \times \frac{1}{2} \times \frac{5}{3} \times \frac{7}{2} \times \frac{24}{37} \times \frac{37}{19} \times \frac{3}{4} \times \frac{37}{2} \times \frac{7}{2} \times \frac{1}{3} = 1.
 \end{aligned}$$

$$\begin{aligned}
 \text{ii.} \quad & \frac{21}{1\frac{1}{2} + \frac{11\frac{1}{2}}{1 + \frac{\frac{5}{12} + \frac{5}{18} + \frac{23}{72}}}} - \frac{36}{21 - \frac{33}{6 - \frac{7}{2\frac{1}{2} + \frac{3}{8}}}} = \frac{21}{1\frac{1}{2} + \frac{11\frac{1}{2}}{2\frac{1}{11}}} - \frac{36}{21 - \frac{33}{3\frac{1}{3}}} = \frac{21}{\frac{1}{7}} - \frac{36}{\frac{1}{3}} = 3 \\
 & - 3 = 0.
 \end{aligned}$$

EXERCISE XXVIII., p. 43.

- 1) i. $\frac{7}{12} \times 30 = 35s. = 8s. 9d.$; ii. $\frac{9}{22} \times \frac{1}{2} = \frac{9}{44}l. = £2 5s.$;
 iii. $\frac{2}{3} \times \frac{3}{4} = \frac{1}{2}l. = 10s.$; iv. $\frac{1}{13} \times \frac{272}{1} = 21s., \text{ or } £1 1s.$;
 v. $\frac{7}{8} \times \frac{3}{4} = \frac{21}{32}s. = 15s. 3\frac{3}{4}d.$
- 2) i. $\frac{9}{10} \times \frac{5}{4} = \frac{9}{8}l. = £1 2s. 6d.$; ii. $\frac{5}{14} \times \frac{4}{9} = \frac{20}{126}l. = £3 10s.$;
 iii. $\frac{1}{12} \times \frac{1}{2} = \frac{1}{24}l. = £4 8s.$
- 3) i. $\frac{1}{8} \times \frac{3}{4} = \frac{3}{32}l. = £1 17s. 9\frac{3}{4}d.$; ii. $\frac{12}{13} \times \frac{4}{21} = \frac{16}{159}l. = 11s. 8d.$;

$$\begin{array}{r} \text{iii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 4 \quad 3 \quad 2\frac{1}{2} \times 1\frac{1}{4} \\ 1 \quad 0 \quad 9\frac{3}{8} \\ \hline 5 \quad 4 \quad 0\frac{1}{8} \end{array} \end{array}$$

$$\begin{array}{r} \text{iv.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 15 \quad 8 \quad 11 \times 1\frac{2}{11} \\ \hline 3 \\ 11) 46 \quad 6 \quad 9 \\ \hline 4 \quad 4 \quad 3 \\ 15 \quad 8 \quad 11 \\ \hline 19 \quad 13 \quad 2 \end{array} \end{array}$$

$$\begin{array}{r} (4) \text{ i.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 8 \quad 8 \quad 2\frac{3}{4} \times 4\frac{2}{3} \\ \hline 3 \\ 8) 25 \quad 4 \quad 8\frac{1}{4} \\ \hline 3 \quad 3 \quad 1\frac{1}{33} \\ 33 \quad 12 \quad 11 \\ \hline 36 \quad 16 \quad 0\frac{1}{33} \end{array} \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 13 \quad 12 \quad 3 + \frac{2}{10} \\ \hline 10 \\ 9) 136 \quad 2 \quad 6 \\ \hline 15 \quad 2 \quad 6 \end{array} \end{array}$$

$$\begin{array}{r} \text{iii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 10 \quad 15 \quad 7 + 1\frac{5}{8} \\ \hline 8 \\ 13) 86 \quad 4 \quad 8 \\ \hline 6 \quad 12 \quad 8 \end{array} \end{array}$$

$$\text{iv. } £112 \text{ } 10\text{s. } 7\text{d.} \times \frac{8}{113} = \frac{27907}{113} \times \frac{8}{113} = \frac{2391}{30} \text{l.} = £7 \text{ } 19\text{s. } 4\text{d.}$$

$$\begin{array}{r} (5) \text{ i.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 19 \quad 4 \quad 11 + 3\frac{1}{8} \\ \hline 8 \\ 25 \left\{ \begin{array}{l} (5) 153 \quad 19 \quad 4 \\ (5) 30 \quad 15 \quad 10\frac{1}{2} \\ \hline 6 \quad 3 \quad 2\frac{2}{25} \end{array} \right. \end{array} \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 11 \quad 14 \quad 3\frac{1}{2} \times \frac{5}{18} \\ \hline 5 \\ 16 \left\{ \begin{array}{l} (2) 58 \quad 11 \quad 5\frac{1}{2} \\ (8) 29 \quad 5 \quad 8\frac{3}{4} \\ \hline 3 \quad 13 \quad 2\frac{19}{32} \end{array} \right. \end{array} \end{array}$$

$$\begin{array}{r} \text{iii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 6 \quad 12 \quad 8 \times 1\frac{5}{8} \\ \hline 13 \\ 8) 86 \quad 4 \quad 8 \\ \hline 10 \quad 15 \quad 7 \end{array} \end{array}$$

$$\begin{array}{r} \text{iv.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 3 \quad 12 \quad 2\frac{1}{4} \times \frac{9}{17} \\ \hline 6 \\ 77 \left\{ \begin{array}{l} (7) 21 \quad 13 \quad 1\frac{1}{2} \\ (11) 3 \quad 1 \quad 10\frac{1}{2} \\ \hline 0 \quad 5 \quad 7\frac{1}{2} \end{array} \right. \end{array} \end{array}$$

$$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 7 \quad 14 \quad 2\frac{1}{2} + 1\frac{7}{8} \\ \hline 9 \\ 6 \left\{ \begin{array}{l} 2) 69 \quad 7 \quad 10\frac{1}{2} \\ 8) 34 \quad 13 \quad 11\frac{1}{2} \end{array} \right. \\ \hline 4 \quad 6 \quad 8\frac{29}{32} \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 3) 9 \quad 11 \quad 1 \times 4\frac{1}{2} \\ \hline 3 \quad 3 \quad 8\frac{1}{2} \\ 38 \quad 4 \quad 4 \\ \hline 41 \quad 8 \quad 0\frac{1}{2} \end{array} \end{array}$$

ii. £3 6s. 8d. $\times 8\frac{3}{4} = \frac{10}{3} \times \frac{25}{4} = £\frac{175}{6} = £29 \text{ 3s. 4d.}$

$$\begin{array}{r} \text{v.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 7 \quad 9 \quad 2\frac{3}{4} + \frac{9}{11} \\ \hline 11 \\ 9) 82 \quad 1 \quad 6\frac{1}{4} \\ \hline 9 \quad 2 \quad 4\frac{25}{36} \end{array} \end{array}$$

$$\begin{array}{r} \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 7 \quad 0 \quad 7 \times \frac{3}{7} \\ \hline 3 \\ 7) 21 \quad 1 \quad 9 \\ \hline 3 \quad 0 \quad 3 \end{array} \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 8 \quad 4 \quad 3\frac{1}{4} \times \frac{5}{8} \\ \hline 5 \\ 6) 41 \quad 1 \quad 4\frac{1}{4} \\ \hline 6 \quad 16 \quad 10\frac{17}{24} \end{array} \end{array}$$

$$\begin{array}{r} \text{ii.} \quad 7) \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 14 \quad 7 \quad 3\frac{1}{2} \times \frac{1}{7} \\ \hline 2 \quad 1 \quad 0\frac{1}{2} \end{array} \end{array}$$

$$\begin{array}{r} \text{iv.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 15 \quad 2 \quad 4\frac{3}{4} \times \frac{9}{10} \\ \hline 9 \\ 10) 136 \quad 1 \quad 6\frac{3}{4} \\ \hline 13 \quad 12 \quad 1\frac{7}{8} \end{array} \end{array}$$

$$\begin{array}{r} \text{i.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 3 \quad 7 \quad 10\frac{1}{2} \times \frac{10}{3} \\ \hline 10 \\ 3) 33 \quad 18 \quad 9 \\ \hline 11 \quad 6 \quad 3 \end{array} \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 4 \quad 5 \quad 6\frac{1}{2} \times \frac{7}{10} \\ \hline 7 \\ 10) 29 \quad 18 \quad 9\frac{1}{2} \\ \hline 2 \quad 19 \quad 10\frac{11}{20} \end{array} \end{array}$$

iii. $\frac{4}{9} \times \frac{3}{1} = \frac{4}{3}$ tons = 1 ton 6 cwt. 2 qrs. 18 lbs. 10 oz. $10\frac{2}{3}$ drs.

$$\begin{array}{r} \text{iv.} \quad \begin{array}{r} \text{cwt.} \quad \text{qrs.} \quad \text{lbs.} \\ 11 \quad 2 \quad 8 \times \frac{5}{12} \\ \hline 5 \\ 12) 57 \quad 3 \quad 12 \\ \hline 4 \quad 3 \quad 8 \end{array} \end{array}$$

(9) i. $\begin{array}{r} \text{cwt. qrs. lbs. oz.} \\ 7 \quad 3 \quad 2 \quad 13 + 1\frac{3}{8} \\ \hline 8 \\ 11 \overline{) 62 \quad 0 \quad 22 \quad 8} \\ \hline 5 \quad 2 \quad 17 \quad 5 \quad \text{drs.} \quad 1\frac{5}{11} \end{array}$

iii. $\begin{array}{r} \text{cwt. qrs. lbs.} \\ 3 \quad 0 \quad 7 + 1\frac{1}{2} \\ \hline 7 \\ 11 \overline{) 21 \quad 1 \quad 21} \\ \hline 1 \quad 3 \quad 22 \quad \text{oz. drs.} \quad 5\frac{9}{11} \end{array}$

(10) i. $\begin{array}{r} \text{tons cwt. qrs. lbs. oz. drs.} \\ 5 \quad 15 \quad 2 \quad 6 \quad 7 \quad 5\frac{1}{2} + 14\frac{2}{5} \\ \hline 5 \\ 72 \left\{ \begin{array}{l} (6) \overline{) 28 \quad 17 \quad 3 \quad 4 \quad 4 \quad 11\frac{1}{2}} \\ (12) \overline{) 4 \quad 16 \quad 1 \quad 5 \quad 6 \quad 1\frac{1}{12}} \\ \hline 0 \quad 8 \quad 0 \quad 2 \quad 12 \quad 8\frac{23}{144} \end{array} \right. \end{array}$

iii. $\begin{array}{r} \text{cwt. qrs. lbs.} \\ 1 \quad 1 \quad 4 \times \frac{2}{3} \\ \hline 2 \\ 3 \overline{) 2 \quad 2 \quad 8} \\ \hline 0 \quad 3 \quad 12 \end{array}$

(11) i. $\begin{array}{r} \text{mils. fur. yds. ft. in.} \\ 45 \quad 5 \quad 3 \quad 2 \quad 9 \times 7\frac{11}{14} \\ \hline 11 \\ 14 \left\{ \begin{array}{l} (7) \overline{) 501 \quad 7 \quad 43 \quad 0 \quad 3} \\ (2) \overline{) 71 \quad 5 \quad 131 \quad 2 \quad 7\frac{1}{2}} \\ \hline 35 \quad 6 \quad 175 \quad 2 \quad 9\frac{9}{14} \\ 319 \quad 3 \quad 27 \quad 1 \quad 3 \\ \hline 355 \quad 1 \quad 203 \quad 1 \quad 0\frac{9}{14} \end{array} \right. \end{array}$

iii. $\begin{array}{r} \text{sq. mls. A. R. P.} \\ 5 \quad 33 \quad 1 \quad 9\frac{5}{8} \times \frac{222}{25} \text{ or } \frac{3}{5} \\ \hline 3 \\ 5 \overline{) 15 \quad 99 \quad 3 \quad 28\frac{7}{8}} \\ \hline 3 \quad 19 \quad 3 \quad 37\frac{31}{40} \end{array}$

ii. $\begin{array}{r} \text{tons cwt. qrs.} \\ 2 \quad 2 \quad 2 \times \frac{5}{8} \\ \hline 5 \\ 8 \overline{) 10 \quad 12 \quad 2} \\ \hline 1 \quad 6 \quad 2 \quad 7 \quad \text{lbs.} \end{array}$

iv. $\begin{array}{r} \text{£ s. d.} \\ 46 \quad 7 \quad 2\frac{1}{2} + 4\frac{1}{2} \\ \hline 5 \\ 21 \left\{ \begin{array}{l} (3) \overline{) 231 \quad 16 \quad 0\frac{1}{2}} \\ (7) \overline{) 77 \quad 5 \quad 4\frac{1}{8}} \\ \hline 11 \quad 0 \quad 9\frac{1}{8} \end{array} \right. \end{array}$

ii. $\begin{array}{r} \text{oz. drs. scr. gra.} \\ 11 \quad 7 \quad 2 \quad 5 \times \frac{7}{4} \\ \hline 7 \\ 4 \overline{) 6 \quad 11 \quad 6 \quad 0 \quad 15} \\ \hline 1 \quad 8 \quad 7 \quad 1 \quad 13\frac{3}{4} \end{array}$

iv. $\begin{array}{r} \text{s. d.} \\ 11 \overline{) 7 \quad 9\frac{3}{4} \times 5\frac{1}{11}} \\ \hline 0 \quad 8\frac{23}{44} \\ 1 \quad 19 \quad 0\frac{1}{4} \\ \hline 1 \quad 19 \quad 9\frac{3}{11} \end{array}$

ii. $\begin{array}{r} \text{wks. dys.} \\ 3 \quad 5\frac{1}{4} + \frac{7}{33} \\ \hline 11 \\ 10 \quad 2 \quad 0\frac{1}{4} \\ \hline 3 \\ 7 \overline{) 31 \quad 2 \quad 0\frac{1}{4}} \\ \hline 4 \quad 2 \quad 0\frac{3}{28} \end{array}$

iv. $\begin{array}{r} \text{yrs. wks. dys. hrs.} \\ 2 \quad 3 \quad 4 \quad 19\frac{1}{4} + 8\frac{1}{4} \\ \hline 7 \\ 60 \overline{) 14 \quad 25 \quad 5 \quad 14\frac{1}{4}} \\ \hline 12 \quad 3 \quad 22\frac{31}{48} \end{array}$

2) i. $\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 19 \quad 6 \quad 11\frac{1}{4} \times 17\frac{3}{40} \text{ or } \frac{343}{20} \\ \hline \end{array}$

$$\begin{array}{r} 135 \quad 8 \quad 6\frac{3}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 947 \quad 19 \quad 11\frac{1}{4} \\ \hline \end{array}$$

2,0) $\begin{array}{r} 663,5 \quad 19 \quad 6\frac{3}{4} \\ \hline \end{array}$

$$\begin{array}{r} 331 \quad 15 \quad 11\frac{5}{8} \\ \hline \end{array}$$

ii. $\frac{6\frac{5}{8}}{1\frac{1}{24}}$ of £11 11s. 11 $\frac{1}{2}$ d. = $\frac{59}{8} \times \frac{24}{25} \times \frac{5567}{2} = \frac{1312612}{75}$ d. = £72 19s. 9 $\frac{3}{4}$ d.

iii. $\frac{2}{3} \times \frac{27}{4} = \frac{9}{2}$ s. = 4s. 6d.

iv. 3 tons 5 cwt. 10 $\frac{3}{4}$ lbs. + $\frac{4\frac{1}{2}}{\frac{5}{8}} = \frac{29183}{4} \times \frac{2}{9} \times \frac{5}{8} = \frac{48605}{36}$ lbs.
= 12 cwt. 0 qrs. 6 $\frac{5}{8}$ lbs.

3) i. £1 $\frac{2}{3}$ + 5 $\frac{7}{18}$ s. + 11 $\frac{1}{4}$ d.

$$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 1 \quad 13 \quad 4 \\ \quad \quad 5 \quad 5\frac{1}{4} \\ \hline \quad \quad 11\frac{3}{4} \end{array}$$

∴ sum = 1 19 9

ii. $\begin{array}{r} \text{mils. fur. yds. ft. in.} \\ 11 \quad 2 \quad 111 \quad 2 \quad 11\frac{1}{2} + \frac{5\frac{8}{11}}{3\frac{1}{2}} \text{ or } \frac{18}{11} \\ \hline \quad \quad \quad 11 \end{array}$

18) $\begin{array}{r} 2) 124 \quad 3 \quad 131 \quad 2 \quad 6\frac{1}{2} \\ 9) 62 \quad 1 \quad 175 \quad 2 \quad 9\frac{1}{4} \\ \hline \quad \quad 6 \quad 7 \quad 68 \quad 1 \quad 3\frac{25}{32} \end{array}$

iii. £7 $\frac{4}{5}$ + 15 $\frac{2}{3}$ s. + 6 $\frac{1}{2}$ d.

$$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 7 \quad 16 \quad 0 \\ \quad \quad 15 \quad 8 \\ \hline \quad \quad 6\frac{1}{2} \end{array}$$

∴ sum = 8 12 2 $\frac{1}{2}$

iv. $\begin{array}{r} \text{mils. fur. yds. ft. in.} \\ 92 \quad 4 \quad 103 \quad 2 \quad 11 + \frac{3\frac{5}{8}}{2\frac{1}{8}} \text{ or } \frac{12}{7} \\ \hline \quad \quad \quad 7 \end{array}$

12) $\begin{array}{r} 647 \quad 7 \quad 67 \quad 2 \quad 5 \\ \hline \quad \quad 53 \quad 7 \quad 207 \quad 0 \quad 11\frac{5}{12} \end{array}$

4) i. £1 $\frac{5}{8}$ + 19 $\frac{11}{12}$ s. + (11 $\frac{3}{4}$ of £ $\frac{3}{10}$ or £3 $\frac{21}{40}$)

$$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 1 \quad 12 \quad 6 \\ \quad \quad 19 \quad 11 \\ \hline \quad \quad 3 \quad 10 \quad 6 \end{array}$$

∴ sum = 6 2 11

ii. $\begin{array}{r} \text{dys. hrs. min. sec.} \\ 5 \quad 3 \quad 17 \quad 53 \times \frac{1\frac{7}{11}}{1\frac{1}{25}} \text{ or } \frac{25}{22} \\ \hline \quad \quad \quad 5 \end{array}$

$$\begin{array}{r} 25 \quad 16 \quad 29 \quad 25 \\ \hline \quad \quad \quad 5 \end{array}$$

22) $\begin{array}{r} 2) 128 \quad 10 \quad 27 \quad 5 \\ 11) 64 \quad 5 \quad 13 \quad 32\frac{1}{2} \\ \hline \quad \quad 5 \quad 20 \quad 6 \quad 41\frac{3}{22} \end{array}$

<p>(15) i. $\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ \frac{2}{3} \times 16 = \text{£} \frac{32}{3} = 3 \ 11 \ \frac{1}{3} \\ 5\frac{5}{8} \times 6\frac{2}{3}\text{s.} = \frac{1000}{27}\text{s.} = 1 \ 17 \ 0\frac{2}{3} \\ 5\frac{1}{3} \times 1\frac{4}{23}\text{d.} = 6 \\ \therefore \text{sum} = 5 \ 8 \ 7\frac{7}{9} \end{array}$</p>	<p>ii. $\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 6\frac{1}{2} \text{ of } \text{£} 3 = \text{£} \frac{13}{2} = 19 \ 14 \ 6 \\ 2\frac{1}{2} \text{ of } 1\frac{3}{4} \text{ of } 16\text{s.} = \frac{400}{7}\text{s.} = 2 \ 17 \ 1\frac{1}{7} \\ \frac{1}{11} \text{ of } 1\frac{4}{7} \text{ of } 6\text{d.} = \frac{9}{7}\text{d.} \\ \therefore \text{sum} = 22 \ 11 \ 6 \end{array}$</p>
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<p>(16) i. $\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 7) 55 \ 16 \ 8\frac{1}{2} \div 6\frac{1}{2} \times 4 = 7 \\ \quad \quad \quad 7 \ 19 \ 6\frac{11}{18} \end{array}$</p>	<p>ii. $\begin{array}{r} \text{ton cwt. qrs. lbs.} \\ \frac{5}{18} \text{ of } 4 \text{ tons} = 1 \ 5 \ 0 \ 0 \\ \frac{9}{20} \text{ of } 6 \text{ cwt.} = 2 \ 2 \ 22\frac{1}{2} \\ 1\frac{1}{4} \text{ of } 3 \text{ qrs.} = 3 \ 21 \\ \therefore \text{sum} = 1 \ 8 \ 2 \ 16\frac{1}{2} \end{array}$</p>
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EXERCISE XXIX., p. 45.

<p>(1) i. $\frac{4\text{s.}}{20\text{s.}} = \frac{1}{5};$</p>	<p>ii. $\frac{7\text{s. } 6\text{d.}}{10\text{s.}} = \frac{7\frac{1}{2}}{10} = \frac{15}{20} \times \frac{1}{10} = \frac{1}{4}.$</p>
<p>(2) i. $\frac{9\text{s. } 4\text{d.}}{\text{£} 1 \ 1\text{s.}} = \frac{9\frac{1}{3}}{21} = \frac{28}{3} \times \frac{1}{21} = \frac{4}{9};$</p>	<p>ii. $\frac{15\text{s. } 2\text{d.}}{4\text{s. } 4\text{d.}} = \frac{15\frac{1}{3}}{4\frac{2}{3}} = \frac{91}{8} \times \frac{3}{13} = \frac{7}{2} = 3\frac{1}{2}.$</p>
<p>(3) i. $\frac{7\text{s. } 4\text{d.}}{2\text{s. } 9\text{d.}} = \frac{7\frac{1}{3}}{2\frac{3}{4}} = \frac{22}{3} \times \frac{4}{11} = \frac{8}{3} = 2\frac{2}{3};$</p>	<p>ii. $\frac{\text{£} 5 \ 11\text{s. } 5\text{d.}}{\text{£} 17 \ 10\text{s. } 2\text{d.}} = \frac{1337}{4202} = \frac{7}{23}.$</p>
<p>(4) i. $\frac{\text{£} 7 \ 15\text{s. } 4\text{d.}}{\text{£} 9 \ 14\text{s. } 2\text{d.}} = \frac{1864}{2336} = \frac{4}{5};$</p>	<p>ii. $\frac{7\text{s. } 2\frac{1}{2}\text{d.}}{10\text{s. } 9\frac{3}{4}\text{d.}} = \frac{86\frac{1}{2}}{129\frac{3}{4}} = \frac{173}{259} \times \frac{4}{518} = \frac{1}{3}.$</p>
<p>(5) i. $\frac{8\text{s. } 8\frac{1}{2}\text{d.}}{\text{£} 1 \ 11\text{s. } 8\text{d.}} = \frac{104\frac{1}{2}}{380} = \frac{209}{760} \times \frac{1}{380} = \frac{11}{40};$</p>	<p>ii. $\frac{\text{£} 5 \ 5\text{s. } 1\text{d.}}{\text{£} 1 \ 12\text{s. } 4\text{d.}} = \frac{1261}{388} = \frac{13}{4} = 3\frac{1}{4}.$</p>
<p>(6) i. $\frac{\text{£} 3 \ 12\text{s. } 8\text{d.}}{\text{£} 8 \ 12\text{s. } 7\text{d.}} = \frac{72\frac{2}{3}}{172\frac{7}{12}} = \frac{218}{3} \times \frac{12}{2071} = \frac{8}{19};$</p>	<p>ii. $\frac{\text{£} 5 \ 14\text{s. } 7\text{d.}}{\text{£} 1 \ 17\text{s. } 9\frac{3}{4}\text{d.}} = \frac{1375}{1}{1816} \times \frac{4}{1816} = \frac{100}{33} = 3\frac{1}{33}.$</p>
<p>(7) i. $\frac{\text{£} 1 \ 6\text{s. } 3\text{d.}}{5\frac{1}{2}\text{gs.}} = \frac{26\frac{1}{2}}{4\frac{1}{2}} = \frac{105}{4} \times \frac{4}{441} = \frac{5}{21};$</p>	<p>ii. $\frac{\text{£} 6 \ 16\text{s. } 6\text{d.}}{\text{£} 3 \ 15\text{s. } 10\text{d.}} = \frac{136\frac{1}{2}}{76\frac{5}{8}} = \frac{273}{2} \times \frac{8}{455} = \frac{9}{5} = 1\frac{4}{5}.$</p>
<p>(8) i. $\frac{\text{£} 2 \ 0\text{s. } 1\frac{1}{2}\text{d.}}{\text{£} 1 \ 11\text{s. } 1\frac{1}{2}\text{d.}} = \frac{481\frac{1}{2}}{373\frac{1}{2}} = \frac{963}{747} \times \frac{2}{747} = \frac{107}{83} = 1\frac{24}{83};$</p>	

- ii. $\frac{\text{£1 } 10\text{s. } 4\text{d.}}{\text{£3 } 17\text{s.}} = \frac{30\frac{1}{4}}{77} = \frac{91}{3} \times \frac{1}{77} = \frac{13}{33}.$
- 9) i. $\frac{1596}{2352} \text{ dwts.} = \frac{19}{28};$ ii. $\frac{726}{1573} \text{ grs.} = \frac{6}{13}.$
- 0) i. $\frac{5\frac{1}{2}}{35} \text{ lbs.} = \frac{11}{4} \times \frac{1}{35} = \frac{1}{10};$ ii. $\frac{196}{85\frac{1}{2}} \text{ cwt.} = \frac{196}{1} \times \frac{2}{343} = \frac{16}{7} = 2\frac{2}{7}.$
- 1) i. $\frac{1095}{3723} \text{ lbs.} = \frac{5}{17};$ ii. $\frac{270}{1336\frac{1}{2}} \text{ lbs.} = \frac{270}{1} \times \frac{2}{2673} = \frac{20}{99}.$
- 2) i. $\frac{3\frac{1}{18}}{1\frac{3}{18}} \text{ cwt.} = \frac{49}{18} \times \frac{16}{19} = \frac{49}{19} = 2\frac{11}{19};$ ii. $\frac{320}{16 \times 4 \times 28} \text{ lbs.} = \frac{5}{28}.$
- 3) i. $\frac{372}{2790} \text{ lbs.} = \frac{2}{15};$ ii. $\frac{82}{10\frac{1}{4}} \text{ qrs.} = \frac{82}{1} \times \frac{4}{41} = 8.$
- 4) i. $\frac{61\frac{1}{4}}{943\frac{1}{4}} \text{ qrs.} = \frac{245}{4} \times \frac{4}{3773} = \frac{5}{77};$
 ii. $\frac{20 \times 4}{67\frac{1}{2}} \text{ qrs.} = \frac{20 \times 4 \times 2}{135} = \frac{32}{27} = 1\frac{5}{27}.$
- 5) i. $\frac{502}{2489\frac{1}{12}} \text{ ft.} = \frac{502}{1} \times \frac{12}{29868} = \frac{24}{119};$
 ii. $\frac{6548}{25646\frac{1}{3}} \text{ yds.} = \frac{6548 \times 3}{76939} = \frac{13}{27}.$
- 6) i. $\frac{17439 \times 9 \times 144}{63943} \text{ in.} = \frac{3888}{11} = 353\frac{5}{11};$
 ii. $\frac{1580 \times \frac{121}{4} \times 9 \times 144}{4607280} \text{ in.} = \frac{121}{9} = 13\frac{4}{9}.$
- 7) i. $\frac{7 \times 24}{154} \text{ hrs.} = \frac{12}{11} = 1\frac{1}{11};$ ii. $\frac{33909}{941\frac{11}{12}} \text{ min.} = \frac{33909}{1} \times \frac{12}{11303} = 36.$
- 8) i. $\frac{242}{71\frac{1}{2}} \text{ qts.} = \frac{242}{1} \times \frac{2}{143} = \frac{44}{13} = 3\frac{5}{13};$
 ii. $\frac{251\frac{1}{2}}{1006 \times 2} \text{ gals.} = \frac{503}{2} \times \frac{1}{1006 \times 2} = \frac{1}{8}.$
- 9) i. $\frac{2090}{8 \times 40 \times 5\frac{1}{2} \times 3} \text{ ft.} = \frac{2090 \times 2}{8 \times 40 \times 11 \times 3} = \frac{19}{48};$
 ii. $\frac{275517}{160 \times 30\frac{1}{4} \times 9 \times 144} \text{ in.} = \frac{275517 \times 4}{160 \times 121 \times 9 \times 144} = \frac{253}{5760}.$
- 0) i. $\frac{121}{8 \times 4 \times 2} \text{ gals.} = \frac{121}{64} = 1\frac{57}{64};$ ii. $\frac{4950}{12 \times 8 \times 3 \times 20} \text{ grs.} = \frac{55}{64}.$

EXERCISE XXX., p. 46.

- (1) i. $\frac{\frac{4}{5} \text{ of } 5}{20} s. = \frac{4}{5} \times \frac{5}{1} \times \frac{1}{20} = \frac{1}{5}$; ii. $\frac{\frac{7}{15} \text{ of } 20}{21} s. = \frac{7}{15} \times \frac{20}{1} \times \frac{1}{21} = \frac{4}{9}$.
- (2) i. $\frac{\frac{3}{8} \text{ of } 1\frac{1}{2}}{37\frac{1}{2}} s. = \frac{3}{8} \times \frac{3}{2} \times \frac{1}{75} = \frac{3}{200}$; ii. $\frac{\frac{2\frac{1}{2}}{7} \text{ of } 1\frac{3}{4}}{7} l. = \frac{7}{3} \times \frac{5}{3} \times \frac{1}{7} = \frac{5}{9}$.
- (3) i. $\frac{\frac{3\frac{1}{2}}{2} \times \frac{\pounds 1\frac{1}{2}}{62}}{\pounds 62} = \frac{21}{9} \times \frac{3}{8} \times \frac{1}{62} = \frac{1}{16}$; ii. $\frac{\frac{1\frac{3}{4}}{2} \text{ of } \frac{\pounds 1\frac{5}{8}}{143}}{\pounds 143} = \frac{11}{8} \times \frac{13}{8} \times \frac{1}{143} = \frac{1}{64}$.
- (4) i. $\frac{\frac{1\frac{1}{2}}{2} \times \frac{\pounds 1\frac{1}{2}}{3}}{\pounds \frac{1}{2}} = \frac{15}{8} \times \frac{1}{3} \times \frac{3}{1} = \frac{5}{4} = 1\frac{1}{4}$; ii. $\frac{\frac{2\frac{1}{2}}{20} \text{ of } 3\frac{1}{2}}{20} \text{ cwt.} = \frac{5}{2} \times \frac{7}{2} \times \frac{1}{20} = \frac{7}{16}$.
- (5) i. $\frac{1\frac{1}{2} \text{ of } 21\frac{1}{2}}{12 \times 7} \text{ dys.} = \frac{3}{2} \times \frac{45}{4} \times \frac{1}{84} = \frac{15}{224}$;
 ii. $\frac{\frac{1\frac{1}{2}}{162\frac{1}{2}} \text{ of } 54\frac{1}{2}}{162\frac{1}{2}} s. = \frac{15}{8} \times \frac{325}{8} \times \frac{2}{325} = \frac{5}{8}$.
- (6) i. $\frac{\frac{8}{15} \text{ of } 11\frac{1}{2}}{3} \text{ qrs.} = \frac{8}{15} \times \frac{45}{4} \times \frac{1}{3} = 2$; ii. $\frac{\frac{9\frac{3}{4}}{26 \times \frac{21}{5}} c.}{26 \times \frac{21}{5}} c. = \frac{75}{8} \times \frac{1}{25} \times \frac{5}{21} = \frac{5}{56}$.
- (7) i. $\frac{\frac{2\frac{1}{2}}{2190} \text{ of } 730}{2190} \text{ yds.} = \frac{14}{5} \times \frac{730}{1} \times \frac{1}{2190} = \frac{14}{15}$;
 ii. $\frac{\frac{7\frac{1}{2}}{1329\frac{1}{8}} \text{ of } 53\frac{1}{8}}{1329\frac{1}{8}} s. = \frac{50}{7} \times \frac{319}{8} \times \frac{6}{7975} = \frac{3}{7}$.
- (8) i. $\frac{\frac{3\frac{1}{8}}{167\frac{1}{2}} \text{ of } 33\frac{1}{2}}{167\frac{1}{2}} \text{ qrs.} = \frac{25}{8} \times \frac{67}{2} \times \frac{2}{335} = \frac{5}{8}$;
 ii. $\frac{\frac{2\frac{1}{2}}{8\frac{1}{2}} \text{ of } 1\frac{3}{4}}{8\frac{1}{2}} \text{ rds.} = \frac{5}{2} \times \frac{7}{4} \times \frac{4}{35} = \frac{1}{2}$.
- (9) i. $\frac{\frac{8}{15} \text{ of } 220 \times 3}{6 \times 8} \text{ ft.} = \frac{8}{15} \times \frac{220}{1} \times \frac{3}{1} \times \frac{1}{6} \times \frac{1}{8} \times \frac{22}{3} = 7\frac{1}{3}$;
 ii. $\frac{\frac{7\frac{1}{2}}{32 \times 8} \text{ of } 94}{32 \times 8} \text{ gills} = \frac{64}{9} \times \frac{94}{32 \times 8} = \frac{47}{18} = 2\frac{11}{18}$.
- (10) i. $\frac{\frac{7\frac{1}{2}}{10 \times 5} \text{ of } 7\frac{1}{2}}{10 \times 5} \text{ qrs.} = \frac{15}{2} \times \frac{15}{2} \times \frac{1}{10 \times 5} = \frac{9}{8} = 1\frac{1}{8}$;
 ii. $\frac{\frac{8\frac{3}{4}}{4} \text{ of } 4 \text{ oz. } 3 \text{ drs. } 1 \text{ scr. } 10 \text{ grs.}}{1 \times 12 \times 24 \text{ scr.}} = \frac{35}{4} \times \frac{213}{2} \times \frac{1}{12 \times 24} = \frac{2485}{768} = 3\frac{121}{768}$.
- (11) i. $\frac{\frac{6\frac{3}{4}}{4840} \text{ of } 1870}{4840} \text{ yds.} = \frac{32}{5} \times \frac{1870}{4840} = \frac{136}{55} = 2\frac{26}{55}$;
 ii. $\frac{\frac{13\frac{1}{2}}{4 \times 7 \times 24} \text{ of } 276\frac{3}{4}}{4 \times 7 \times 24} \text{ hrs.} = \frac{40}{3} \times \frac{830}{3} \times \frac{1}{4 \times 7 \times 24} = \frac{2075}{378} = 5\frac{195}{378}$.

- 2) i. $\frac{1\frac{2}{3} \text{ of } 4376}{8752} \text{ yds.} = \frac{5}{3} \times \frac{4376}{8752} = \frac{5}{3};$
 ii. $\frac{4\frac{1}{2} \times 36}{9 \times 63} \text{ gals.} = \frac{2}{3} \times \frac{36}{1} \times \frac{1}{9} \times \frac{1}{63} = \frac{2}{7}.$
- 3) i. $\frac{7\frac{1}{2} \text{ of } 378}{1760} \text{ yds.} = \frac{22}{3} \times \frac{378}{1760} = \frac{63}{40} = 1\frac{23}{40};$
 ii. $\frac{\frac{8}{15} \text{ of } 7 \times 5760}{7000} \text{ grs.} = \frac{8 \times 7 \times 5760}{15 \times 7000} = \frac{364}{125} = 3\frac{9}{125}.$
- 4) i. $\frac{3\frac{1}{2} \text{ of } 376\frac{1}{2}}{1505} \text{ lbs.} = \frac{10}{3} \times \frac{1505}{4} \times \frac{1}{1505} = \frac{1}{3};$
 ii. $\frac{3\frac{1}{2} \text{ of } 4865}{69\frac{1}{2} \times 320} \text{ pls.} = \frac{10}{3} \times \frac{4865}{1} \times \frac{2}{139} \times \frac{1}{320} = \frac{35}{48}.$
- 5) i. $\frac{\frac{6}{7} \text{ of } \frac{7}{4} \text{ of } 897}{\frac{6279}{4}} \text{ d.} = \frac{6}{7} \times \frac{7}{4} \times \frac{897}{1} \times \frac{4}{6279} = \frac{6}{7};$
 ii. $\frac{1\frac{1}{2} \text{ of } \frac{42}{7} \times \frac{945}{2}}{3\frac{3}{4} \times \frac{6}{7} \times \frac{1665}{4}} \text{ d.} = \frac{3}{2} \times \frac{30}{7} \times \frac{945}{2} \times \frac{4}{15} \times \frac{7}{6} \times \frac{4}{1665} = \frac{84}{37} = 2\frac{10}{37}.$
- 6) i. $\frac{6\frac{1}{2} \text{ of } 9500}{7 \times 7000} \text{ grs.} = \frac{49}{8} \times \frac{9500}{1} \times \frac{1}{7 \times 7000} = \frac{19}{16} = 1\frac{3}{16};$
 ii. $\frac{\frac{4}{13} \text{ of } 6\frac{1}{2} \times 58900}{\frac{5}{17} \text{ of } \frac{17}{5} \text{ of } 24 \times 60 \times 60} \text{ sec.} = \frac{4}{13} \times \frac{13}{2} \times \frac{58900}{1} \times \frac{17}{5} \times \frac{5}{17}$
 $\times \frac{1}{24 \times 60 \times 60} = \frac{589}{432} = 1\frac{157}{432}.$
- 7) i. $\frac{3\frac{1}{3} \text{ of } 65}{2 \times 5 \times 4 \times 2\frac{1}{4}} \text{ in.} = \frac{40}{13} \times \frac{65}{1} \times \frac{1}{2} \times \frac{1}{5} \times \frac{1}{4} \times \frac{4}{9} = \frac{20}{9} = 2\frac{2}{9};$
 ii. $\frac{2\frac{1}{2} \text{ of } 6\frac{3}{7} \text{ of } 63}{4\frac{1}{2} \text{ of } 3\frac{4}{7} \text{ of } \frac{357}{2}} \text{ pts.} = \frac{5}{2} \times \frac{45}{7} \times \frac{63}{1} \times \frac{2}{9} \times \frac{7}{25} \times \frac{2}{357} = \frac{6}{17}.$
- 8) i. $\frac{9\frac{3}{8} \text{ of } 960}{15 \times 1760} \text{ yds.} = \frac{75}{8} \times \frac{960}{1} \times \frac{1}{15 \times 1760} = \frac{15}{44};$
 ii. $\frac{6\frac{4}{5} \div \frac{43}{5} \times 413}{4\frac{5}{8} - 2\frac{7}{18} \times 2240} \text{ lbs.} = \frac{40}{7} \times \frac{5}{23} \times \frac{413}{1} \times \frac{16}{35} \times \frac{1}{2240} = \frac{59}{490}.$
- 9) i. $\frac{5\frac{8}{11} \text{ of } \frac{11133}{4}}{1\frac{10}{11} \text{ of } 3711} \text{ lbs.} = \frac{9}{4} = 2\frac{1}{4};$ ii. $\frac{\frac{3}{11} \text{ of } 1\frac{2}{5} \text{ of } 4\frac{5}{6} \text{ l.}}{\frac{2}{15} \text{ of } 7\frac{1}{2} \text{ of } 5} \text{ l.} = \frac{29}{50}.$
- 10) i. $\frac{3\frac{5}{8} \text{ of } 7\frac{7}{8} \text{ of } 5\frac{7}{8} \text{ l.}}{1\frac{10}{17} \text{ of } 2\frac{3}{7} \text{ of } 3\frac{23}{24}} \text{ l.} = \frac{94}{95};$ ii. $\frac{1\frac{5}{7} \text{ of } 1\frac{1}{6} \text{ of } 3\frac{1}{3} \text{ l.}}{5} \text{ l.} = \frac{4}{3} = 1\frac{1}{3}.$

EXERCISE XXXI, p. 48.

$$(1) \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{8} + \frac{1}{8} + \frac{1}{9} + \frac{1}{18} + \frac{1}{24} + \frac{1}{18}$$

$$= \frac{36 + 24 + 18 + 12 + 9 + 8 + 6 + 3 + 4}{72} = \frac{120}{72} = 1\frac{2}{3}.$$

$$\therefore 5 - 1\frac{2}{3} = 3\frac{1}{3}.$$

$$(2) \frac{7}{100} + \frac{5}{10} + \frac{7}{25} + \frac{5}{5} + 5\frac{63}{100} = 5\frac{63 + 270 + 252 + 500 + 225}{900} = 5\frac{1310}{900} \text{ or } 6\frac{41}{90}$$

$$+ (1\frac{3}{8} \text{ of } 1\frac{49}{100} \text{ of } 1\frac{7}{18}) = \frac{591}{90} \times \frac{5}{8} \times \frac{290}{249} \times \frac{18}{25} = \frac{7}{3} = 2\frac{1}{3}.$$

$$(3) \frac{5}{9} \text{ of } 2\frac{1}{2} \times \frac{5760}{1} = 8400 \text{ grs. Troy; } 1 \text{ lb. Av.} = 7000 \text{ grs. Troy.}$$

$$\therefore \frac{8400}{7000} = \frac{6}{5} = 1\frac{1}{5}.$$

$$\pounds \frac{5}{8} \div \pounds 2\frac{1}{2} = \frac{5}{8} \times \frac{2}{5} = \frac{1}{4}.$$

$$(4) \frac{1}{4} \text{ of } \frac{10}{5} = \frac{2}{5}; \frac{1}{5} \text{ of } \frac{10}{3} = \frac{2}{3}; \frac{1}{8} \text{ of } \frac{10}{5} = \frac{1}{4}; \frac{1}{20} \text{ of } \frac{10}{3} = \frac{1}{6}; \frac{1}{25} \text{ of } \frac{10}{3} = \frac{2}{15};$$

$$\frac{1}{50} \text{ of } \frac{10}{3} = \frac{1}{15}.$$

$$\therefore \frac{2}{5} + \frac{2}{3} + \frac{1}{4} + \frac{2}{15} + \frac{1}{15} = \frac{75 + 60 + 50 + 15 + 12 + 6}{90} = \frac{218}{90} = 2\frac{38}{90}.$$

$$\therefore 3\frac{1}{3} - 2\frac{38}{90} = \frac{82}{90}.$$

$$\frac{82}{90} + (\frac{5}{8} \times \frac{2}{3} \times \frac{5}{9}) = \frac{82}{90} + \frac{50}{162} = \frac{988}{810}.$$

$$\text{Then } \frac{988}{810} + \frac{7\frac{16}{33}}{1\frac{7}{8}} \text{ of } 2\frac{1}{4} = \frac{988}{810} \times \frac{33}{247} \times \frac{15}{8} \times \frac{4}{9} = \frac{11}{81}.$$

$$(5) \text{ i. } \frac{\pounds 665\frac{5}{8} \times \frac{5}{8}}{\frac{7}{8}} = \frac{5325}{8} \times \frac{5}{8} \times \frac{8}{7} = \pounds \frac{26625}{42} = \pounds 633 \text{ } 18s. \text{ } 6\frac{3}{4}d.$$

$$\text{ii. } \frac{5}{23} \times \frac{23}{9} = \pounds \frac{5}{9}; \frac{7}{13} \times \frac{16}{21} \times \frac{1}{20} = \pounds \frac{1}{45}.$$

$$\therefore \frac{5}{9} - \frac{1}{45} = \pounds \frac{24}{45} = 10\frac{2}{3}s.$$

$$(6) \text{ i. } 10 - 7\frac{5}{16} = 2\frac{11}{16}; \text{ ii. } (\frac{36}{7} \times \frac{11}{4}) - 7\frac{3}{14} = 14\frac{1}{7} - 7\frac{3}{14} = 6\frac{13}{14}.$$

$$(7) \frac{\pounds 1486\frac{1}{2} \times 1}{\frac{1}{8} \text{ of } \frac{3}{5}} = \frac{7431 \times 6 \times 5}{5 \times 3}l. = \pounds 14862.$$

$$(8) 9 \text{ oz. } 6\frac{3}{8} \text{ dwts.} = 4480 \text{ grs. Troy, and } 1 \text{ lb. Av.} = 7000 \text{ grs. Troy.}$$

$$\therefore \frac{4480}{7000} = \frac{16}{25}.$$

$$(9) \frac{7}{12} \text{ of } 6g. = \frac{7}{12} \times \frac{6 \times 12 \times 91}{1} = 882d.; \frac{3}{8} \text{ of } 7s. \text{ } 6d. = \frac{3}{8} \times \frac{90}{1} = \frac{135}{4}d. = 33\frac{3}{4}d.;$$

$$\frac{5}{14} \text{ of } \pounds 7 \text{ } 4s. \text{ } 9\frac{3}{4}d. = \frac{5}{14} \times \frac{6951}{4} = \frac{4965}{8}d. = 620\frac{5}{8}d.$$

$$\text{Sum} = 882d. + 33\frac{3}{4}d. + 620\frac{5}{8}d. = \frac{12291}{8}d.$$

$$\therefore \frac{\frac{12291}{8}}{\pounds 8 \text{ } 10s. \text{ } 8\frac{1}{4}d.} = \frac{12291}{8} \times \frac{2}{4097} = \frac{3}{4}.$$

$$(10) 9\frac{3}{16} \times 2\frac{11}{12} \div 9\frac{3}{16} = \pounds 2\frac{11}{12} = \pounds 2 \text{ } 18s. \text{ } 4d.$$

$$1) 2\frac{1}{3} + 5\frac{1}{8} + 17\frac{11}{12} + 8\frac{9}{16} = 32\frac{16+6+44+27}{48} = 32\frac{93}{48} = 33\frac{15}{16};$$

$$\therefore 33\frac{15}{16} - 30\frac{5}{8} = 3\frac{15-10}{16} = 3\frac{5}{16}.$$

$$2\frac{5}{8} \text{ of } 9\frac{7}{9} + \frac{28}{15} = \frac{21}{8} \times \frac{68}{9} \times \frac{15}{28} = \frac{55}{4} = 13\frac{3}{4};$$

$$\therefore 15 - 13\frac{3}{4} = 1\frac{1}{4}.$$

$$2) \text{ Product} = \frac{5}{8} \times \frac{7}{12} = \frac{35}{96}; \text{ difference} = \frac{5}{8} - \frac{7}{12} = \frac{30-28}{48} = \frac{2}{48} = \frac{1}{24}.$$

$$\therefore (\frac{5}{8} \div \frac{7}{12}) + \frac{35}{96} + \frac{1}{24} = \frac{15}{14} + \frac{35}{96} + \frac{1}{24} = \frac{720+245+28}{672} = \frac{993}{672} = 1\frac{127}{224}.$$

$$3) \frac{\frac{4}{9} \text{ of } \frac{2}{5} \text{ of } £7 \text{ 18s. } 4\frac{1}{2}d.}{\frac{9}{11}} = \frac{4 \times 2 \times 255 \times 11}{9 \times 5 \times 8 \times 32}l. = £\frac{187}{96} = £1 \text{ 18s. } 11\frac{1}{2}d.$$

$$4) 7\frac{7}{8} + \frac{5}{12} + \frac{3}{20} + 4\frac{7}{16} + 14\frac{3}{8} + 27\frac{5}{9} + 0 + 3\frac{1}{2} + \frac{1}{4} + 0 + \frac{5}{48} + 1\frac{1}{9}$$

$$= 56 + \frac{630+300+108+315+432+400+360+180+75+80}{720}$$

$$= 56\frac{2880}{720} = 60.$$

$$\therefore \text{average} = 60 \div 12 = 5.$$

$$5) \frac{\frac{5}{8}, \frac{2}{3}, \frac{7}{12}, \frac{1}{10}, \frac{6}{11}, \frac{1}{3}, \frac{5}{7}, \frac{1}{9}, \frac{2}{5}, \frac{11}{13}, \frac{6}{7}, \frac{3}{4}, \frac{5}{9}, \frac{4}{5}, \frac{8}{9}, \frac{7}{8}}{225225, 240240, 210210, 36036, 196560, 120120, 300300, 360360}$$

$$51480, 80080, 144144, 304920, 308880, 270270, 200200,$$

$$288288, 320320, 315315$$

$$\frac{8}{9}, \frac{7}{8}, \frac{6}{7}, \frac{11}{13}, \frac{5}{9}, \frac{4}{5}, \frac{3}{4}, \frac{2}{3}, \frac{5}{9}, \frac{7}{12}, \frac{5}{6}, \frac{6}{11}, \frac{2}{5}, \frac{1}{3}, \frac{2}{9}, \frac{1}{7}, \frac{1}{10}.$$

$$6) \text{ No. of yds.} = \frac{1}{9}(27\frac{3}{4} \times 10\frac{2}{3}) \div \frac{2}{3} = \frac{1}{9} \times \frac{111}{4} \times \frac{32}{3} \times \frac{3}{2} = \frac{148}{3} \text{ yds.} = 49\frac{1}{3} \text{ yards.}$$

$$\text{Cost} = \frac{148}{3} \times 3s. 10\frac{1}{4}d. = \frac{148}{3} \times \frac{185}{4}d. = \frac{6845}{3}d. = £9 \text{ 10s. } 1\frac{2}{3}d.$$

$$7) \left. \begin{array}{l} \frac{10}{21} \text{ of } £3 \text{ 7s. } 6d. = \frac{10}{21} \times \frac{810}{1} = \frac{2700}{7}d. = 385\frac{5}{7}d.; \\ \frac{3}{11} \text{ of } 2s. 3\frac{1}{2}d. = \frac{3}{11} \times \frac{55}{2} = \frac{15}{2}d. = 7\frac{1}{2}d.; \\ \frac{16}{33} \text{ of } £1 \text{ 17s. } 9\frac{3}{4}d. = \frac{16}{33} \times \frac{1815}{4} = 220d. \end{array} \right\} \text{sum} = 613\frac{3}{14}d.$$

$$\therefore 613\frac{3}{14}d. \div £20 \text{ 8s. } 9\frac{5}{7}d. = \frac{8585}{14} \times \frac{7}{34340} = \frac{1}{8}.$$

$$8) 2\frac{2}{3} - 1\frac{7}{9} = 1\frac{6-7}{9} = \frac{8}{9}; \quad 3\frac{5}{8} - 2\frac{2}{3} = 1\frac{15-16}{24} = \frac{23}{24}.$$

$$9) \text{ Cost of painting} = \frac{1}{9}\{2(19 \text{ ft. } 8 \text{ in.} + 15 \text{ ft. } 3 \text{ in.}) \times 9\frac{1}{2} \text{ ft.}\} \times 1\frac{1}{2}s.$$

$$= \frac{1}{9} \times \frac{419}{2} \times \frac{19}{2} \times \frac{3}{2} = \frac{7961}{2}s. = £5 \text{ 10s. } 6\frac{5}{8}d.$$

$$(20) \frac{2}{3} - \frac{1}{3} - \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{27 + 4 + 6 - 3 + 16}{72} = \frac{56}{72} = \frac{7}{9}.$$

$\therefore 1 - \frac{7}{9}$, or $\frac{2}{9}$ ths of the orchard contains 20 trees.

$$\therefore \text{No. of trees in orchard} = \frac{20 \times 9}{2} \text{ or } 90.$$

$$(21) \frac{12}{12} \times \frac{11}{12} \times \frac{10}{12} \times \frac{9}{12} \times \frac{8}{12} \times \frac{7}{12} \times \frac{6}{12} \times \frac{5}{12} \times \frac{4}{12} \times \frac{3}{12} \times \frac{2}{12} \times \frac{1}{12} = \frac{1}{12} = 2\frac{1}{2}.$$

$$(22) \frac{140}{54 - \frac{20}{\frac{1}{3} - \frac{1}{12}}} - \frac{60}{20 + \frac{100}{5\frac{1}{2} - \frac{4\frac{1}{2}}{\frac{1}{2} - \frac{1}{12}}}} = \frac{140}{54 - \frac{20}{3\frac{1}{3}}} - \frac{60}{20 + \frac{100}{8\frac{1}{2}}} = \frac{140}{54 + 6} - \frac{60}{20 + 11\frac{13}{17}} = \frac{7}{3} - \frac{17}{9} = \frac{21 - 17}{9} = \frac{4}{9}.$$

$$(23) \frac{2}{7} \text{ of } \frac{2}{1} \times \frac{2}{1} = 30s.; \frac{13}{15} \text{ of } \frac{2}{1} \times \frac{13}{15} = \frac{26}{15} \text{ of } \frac{2}{1} \times \frac{13}{15} = \frac{40}{15}s.$$

$$\therefore \text{difference} = \frac{40}{15} - 30 = \frac{25}{3}s. \quad \text{Then } \frac{\frac{25}{3}s.}{\frac{271}{5}s.} = \frac{25}{3} \times \frac{1}{142\frac{1}{2}} = \frac{1}{20}.$$

$$(24) \frac{2}{3} + \frac{1}{3} + \frac{5}{9} + \frac{7}{12} + \frac{11}{18} + \frac{5}{24} = \frac{48 + 54 + 40 + 42 + 44 + 15}{72} = \frac{243}{72} = 3\frac{3}{8}.$$

$$\therefore 4 - 3\frac{3}{8} = \frac{5}{8}.$$

$$(25) \text{Arable and pasture} = \frac{2}{3} + \frac{1}{4} = \frac{8+3}{12} = \frac{11}{12}.$$

\therefore remaining $\frac{1}{12}$ of estate is equal to 130 acres.

\therefore number of acres in estate = $130 \times 12 = 1560$.

Income = $1560 \times 24\frac{1}{2}s. = \text{£}1911$.

$$(26) (\frac{1}{2} \text{ of } \frac{5}{22} \text{ of } \frac{2}{1} \text{ of } \frac{31}{4} \text{ of } \frac{26}{31} \text{ of } \frac{6}{11}) + (5\frac{7}{8} - 5\frac{7}{24}) = \frac{1035}{8} \times \frac{72}{25} = \frac{1863}{7}.$$

$$\therefore \frac{1863}{7} + (\frac{68}{9} \text{ of } \frac{33}{28} \text{ of } \frac{63}{34} \text{ of } \frac{60}{423} \text{ of } \frac{94}{33} \text{ of } \frac{81}{140}) = \frac{1863}{7} + \frac{27}{7} = \frac{1863 + 27}{7} = \frac{1890}{7} = 270.$$

(27) A can do $\frac{1}{11}$ of the work in 1 day.

B can do $\frac{1}{9}$ of the work in 1 day.

\therefore A and B do $\frac{1}{11} + \frac{1}{9}$, or $\frac{20}{99}$, of the work in 1 day.

\therefore they do the work in $\frac{99}{20}$ or $4\frac{9}{20}$ days.

$$(28) \frac{5}{8} \text{ of } \text{£}5 \ 3s. \ 4d. = \frac{5}{8} \times \frac{1240}{1} = 775d.$$

$$\frac{12}{10} \text{ of } \text{£}1 \ 16s. \ 5d. = \frac{12}{10} \times \frac{437}{1} = 276d.$$

$$\frac{8}{9} \text{ of } \text{£}11 \ 0s. \ 3\frac{1}{4}d. = \frac{8}{9} \times \frac{10575}{4} = 2350d.$$

$$\text{Sum} = 775d. + 276d. + 2350d. = 3401d.$$

$$\text{Then } \frac{3401}{\text{£}37 \ 15s. \ 9\frac{1}{2}d.} = \frac{3401}{1} \times \frac{8}{27208} = \frac{8}{8}.$$

$$(29) \quad \frac{\begin{array}{r} 2 \\ 1 + 118 \\ 264 - 113 \\ \hline 113 \\ 25 \end{array}}{\frac{25}{25}} \times \frac{\begin{array}{r} 6 \frac{83}{132} \\ 1 + \frac{86}{121} \\ 111 + \frac{23}{12} \\ \hline 1 \end{array}}{1} = \frac{\begin{array}{r} 2 \\ 1 + 118 \\ 22 \frac{23}{132} \\ \hline 22 \frac{23}{132} \end{array}}{\frac{22 \frac{23}{132}}{25}} \times \frac{\begin{array}{r} 6 \frac{83}{132} \\ 1 + \frac{86}{121} \\ 1 + \frac{23}{11} \\ \hline 1 \end{array}}{1} = \frac{\frac{132}{25}}{\frac{22 \frac{23}{132}}{25}} \times \frac{\begin{array}{r} 6 \frac{83}{132} \\ 1 + \frac{86}{121} \\ 1 + \frac{23}{11} \\ \hline 1 \end{array}}{\frac{1}{\frac{1}{6}}} = \frac{\frac{132}{25}}{\frac{11}{25}}$$

$$\times \frac{5}{6} = \frac{182}{125} \times \frac{25}{11} \times \frac{5}{6} = 2.$$

- (30) A, B , and C can do $\frac{1}{4}$ of work in 1 day.
 A and C can do $\frac{1}{6}$ of work in 1 day.
 B and C can do $\frac{3}{10}$ of work in 1 day.
 A, B , and $2 C$ do $\frac{1}{6} + \frac{3}{10}$ or $\frac{17}{30}$ in 1 day.
 $\therefore C$ does $\frac{17}{30} - \frac{1}{4}$ or $\frac{5}{48}$ in 1 day.
 $\therefore C$ can do the work in $\frac{48}{5}$ or $9\frac{3}{5}$ days.
- (31) From 1 lb. or 5760 grs. Troy $46\frac{29}{40}$ or $\frac{1869}{40}$ sovereigns are coined.
 \therefore number coined from 1 ton, or $112 \times 20 \times 7000$ grs.

$$= \frac{112 \times 20 \times 7000 \times 1869}{5760 \times 40}$$
, or $\pounds 127195\frac{5}{8}$.
- (32) $\frac{57}{5} \times \frac{9}{28} \times \frac{35}{64} \times \frac{7}{36} \times \frac{12}{45} \times \frac{42}{19} \times \frac{25}{28} \times \frac{96}{48} \times \frac{26}{15} = \frac{3}{4}$.
- (33) Value of timber = $21\frac{1}{3}$ ft. $\times 1\frac{2}{3}$ ft. $\times \frac{3}{4}$ ft. $\times 2\frac{3}{4}$ s. = $\frac{64}{3} \times \frac{5}{3} \times \frac{3}{4} \times \frac{11}{4}$
 $= \frac{220}{3}$ s., or $\pounds 3$ 13s. 4d.
- (34) Length cut off = 5 c. ft. $+(1\frac{2}{3}$ ft. $\times \frac{3}{4}$ ft.) = $\frac{5}{1} \times \frac{3}{5} \times \frac{4}{3}$, or 4 ft.
- (35) $(\frac{15}{4} \times \frac{52}{9} \times \frac{2}{5}) - (\frac{231}{25} \times \frac{5}{81} \times \frac{80}{77})$ of $\pounds 50\frac{5}{8} = (\frac{16}{3} - \frac{16}{9})$ of $\pounds 50\frac{5}{8} = \frac{218}{27}$ of $\frac{4005}{8}$
 $= \pounds 163\frac{3}{4}$.
 $\therefore \frac{163\frac{3}{4}}{4} \div (1\frac{7}{33} \text{ of } \pounds 4 \text{ } 19\text{s.}) = \frac{1635}{4} \times \frac{33}{40} \times \frac{20}{99} = \pounds 54\frac{5}{8} = \pounds 68\frac{1}{8}$.
- (36) Smoking = $\frac{2}{5} \times \frac{3}{10} \times \frac{7}{6} \times \frac{5}{14} = \frac{1}{36}$ of income.
Clothes = $\frac{3}{8} \times \frac{2}{5} \times \frac{2}{9} \times \frac{10}{3} = \frac{1}{9}$ of income.
Incidental expenses = $\frac{1}{12}$ of income.
Total expenses = $\frac{1}{36} + \frac{1}{9} + \frac{1}{12} = \frac{2}{9}$.
 $\therefore 1 - \frac{2}{9}$, or $\frac{7}{9}$ of income left = $\pounds 420$.
Income = $\frac{9 \times 420}{7} = \pounds 540$.

37. A and B can do $\frac{1}{4}$ of work in 1 day.

A and C can do $\frac{1}{5}$ of work in 1 day.

B and C can do $\frac{1}{12}$ of work in 1 day.

Then $\frac{1}{4} + \frac{1}{5} - \frac{1}{12} = \frac{1}{6}$ in 1 day.

$\therefore A, B,$ and C do $\frac{1}{4} + \frac{1}{5} - \frac{1}{12} = \frac{1}{6}$ in 1 day \therefore they finish the work in $\frac{1}{\frac{1}{6}}$ or 6 days.

C does $\frac{1}{5} - \frac{1}{6}$ or $\frac{1}{30}$ in 1 day \therefore he can do the work in 30 days.

B does $\frac{1}{12} - \frac{1}{30}$ or $\frac{1}{20}$ in 1 day \therefore " " 20 days.

A does $\frac{1}{4} - \frac{1}{20}$ or $\frac{3}{10}$ in 1 day \therefore " " $\frac{10}{3}$ or $3\frac{1}{3}$ days.

$$(38) \frac{\frac{1}{12} - \frac{1}{20}}{1 - \frac{1}{12} - \frac{1}{20}} - \frac{1}{1 - \frac{1}{12} - \frac{1}{20}} = \frac{\frac{1}{12} - \frac{1}{20}}{1 - \frac{1}{12} - \frac{1}{20}} + \frac{1}{1 - \frac{1}{12} - \frac{1}{20}} = \frac{\frac{1}{12} - \frac{1}{20}}{1 - \frac{1}{12} - \frac{1}{20}} + \frac{1}{1 - \frac{1}{12} - \frac{1}{20}} = \frac{1}{12} + \frac{1}{20}$$

$$= \frac{5}{60} + \frac{3}{60} = \frac{8}{60} = \frac{2}{15}$$

(39) $\frac{14}{11} \times \frac{21}{23} \times \frac{7}{4} \times \frac{5}{26} = \frac{42}{23}$ of the cargo is sold for £5000.

$1 - \frac{42}{23}$ or $\frac{23}{23}$ of the cargo is remaining.

As $\frac{42}{23}$ of the cargo is worth £5000.

$\therefore \frac{23}{23}$ is worth $(5000 \times \frac{23}{23}) \div \frac{42}{23}$ or £2738 1s. 10 $\frac{2}{3}$ d.

\therefore value of damaged cargo = £5000 + £2738 1s. 10 $\frac{2}{3}$ d. = £7738 1s. 10 $\frac{2}{3}$ d.

Loss = £10000 - £7738 1s. 10 $\frac{2}{3}$ d. = £2261 18s. 1 $\frac{1}{3}$ d.

(40) $\frac{45}{9} \times \frac{48}{7} \times \frac{7}{48} \times \frac{4}{15} \times \frac{35}{9} \times \frac{25}{9} \times \frac{8}{75} \times \frac{12}{35}$ or $\frac{8}{9}$ of population equal 15824 men.

\therefore whole population = $\frac{15824 \times 9}{8} = 17802$ men.

(41) A can do $\frac{1}{10}$ of the work in 1 hour.

B can do $\frac{1}{8}$ of the work in 1 hour.

C can do $\frac{1}{9}$ of the work in 1 hour.

$\therefore A, B,$ and C do $\frac{1}{10} + \frac{1}{8} + \frac{1}{9}$ or $\frac{121}{360}$ in 1 hour.

A and B , before joined by C , do $\frac{1}{10} + \frac{1}{8}$ or $\frac{9}{40}$ of the work.

$\therefore 1 - \frac{9}{40}$ or $\frac{31}{40}$ remains to be done by $A, B,$ and C .

As $A, B,$ and C can do $\frac{121}{360}$ in 1 hour \therefore they will do $\frac{31}{40}$ in $\frac{31 \times 360}{121}$ or $22\frac{38}{121}$ minutes.

(42) $\frac{7}{11}$ of $\frac{1}{4}$ or $\frac{7}{44}$ of estate cost 600 guineas.

\therefore cost of $\frac{25}{24} \times \frac{3}{25} \times \frac{16}{3}$ or $\frac{2}{3} = (600 \times \frac{2}{3}) \div \frac{4}{3} = 900$ guineas.

(43) $\frac{9}{10} \times \frac{16}{11} \times \frac{4}{3} \times \frac{7}{9} \times \frac{5}{18}$ or $\frac{2}{3}$ of mine cost £1976 $\frac{2}{3}$.

\therefore value of $\frac{7}{12} \times \frac{2}{3} \times \frac{16}{9} \times \frac{1}{9}$ or $\frac{1}{9} = (£1976\frac{2}{3} \times \frac{1}{9}) \div \frac{2}{3} = £329$ 8s. 10 $\frac{2}{3}$ d.

$$4) \frac{59}{273} + \frac{\frac{4\frac{11}{13}}{1-\frac{1}{6}}}{1-\frac{1}{6}} = \frac{59}{273} + \frac{\frac{4\frac{11}{13}}{1-\frac{1}{6}}}{1-\frac{1}{6}} = \frac{59}{273} + \frac{\frac{4\frac{11}{13}}{1-\frac{1}{6}}}{1-\frac{1}{6}} = \frac{59}{273} + \frac{4\frac{11}{13}}{\frac{5}{6}}$$

$$= \frac{59}{273} + \frac{1579}{273} = 6.$$

- 5) 1st received $\frac{2}{3}$ of 20 guineas, or £12 $\frac{2}{3}$.
 2nd received $\frac{2}{3}$ of 30 guineas, or £13 $\frac{1}{3}$.
 3rd received $\frac{19}{35}$ of 50 guineas, or £28 $\frac{1}{5}$.
 Money still owed = £105 - £54 $\frac{2}{3}$ = £50 $\frac{2}{3}$.
 $\therefore \frac{50\frac{2}{3}}{54\frac{2}{3}} = \frac{252}{52} \times \frac{5}{13} = \frac{12}{13}$.

$$6) \frac{62}{21} \times \frac{12}{47} \times \frac{395}{132} \times \frac{15}{118} \times \frac{35}{5} \times \frac{33}{34} \times \frac{68}{99} \times \frac{29}{31} \times \frac{5}{12} \times \frac{10}{59} \times \frac{14}{5} \times \frac{47}{20} = \frac{1}{4}.$$

$$7) \frac{1}{3} + \frac{1}{5} + \frac{1}{6} = \frac{10+6+5}{30} = \frac{21}{30} = \frac{7}{10}.$$

$\therefore 1 - \frac{7}{10}$, or $\frac{3}{10}$ of property remaining, is equal to £4860.

\therefore value of entire property = $\frac{4860 \times 10}{3} \text{ l.} = \text{£}16200$.

As $\frac{7}{10}$ is spent in 20 years, therefore $\frac{7}{300}$ is spent in 1 year.

\therefore yearly expenditure = $\frac{7}{300}$ of 16200 = £567.

- 8) Contents of corn bin = $4 \times 3 \times \frac{1}{4} = 3$ cubic ft.

Number of gallons = $\left(33 + \frac{277\frac{1}{2}}{1728}\right) \text{ c. ft.} \times 1 \text{ gal.}$

$$= \frac{33 \times 4 \times 1728}{1109} \text{ gals.} = 3 \text{ qrs. } 1 \text{ bus. } 2 \text{ pks. } 1\frac{751}{1109} \text{ gals.}$$

- 9) A can fill $\frac{1}{30}$ of cistern in 1 minute.

B can fill $\frac{1}{40}$ of cistern in 1 minute.

C can empty $\frac{1}{20}$ of cistern in 1 minute.

\therefore A, B, and C open together fill $\frac{1}{30} + \frac{1}{40} - \frac{1}{20}$ or $\frac{1}{120}$ in 1 minute.

\therefore A, B, and C can fill the cistern in 120 min., or 2 hours.

- 10) $\left(\frac{248}{9} \times \frac{113}{4} \times \frac{3}{22} \times \frac{3}{228}, \text{ or } \frac{1}{2}\right) + \left(\frac{27}{7} \times \frac{4}{3} \times \frac{7}{54} \times \frac{3}{8}, \text{ or } \frac{1}{4}\right)$

$\therefore \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$.

$\left(\frac{3}{4} \text{ of } \frac{400}{1} = 300d.\right) + \left(\frac{3}{4} \text{ of } \frac{60}{1} = 180d.\right) + \frac{48}{11} \text{ of } \frac{55}{2} = 120d.$

$\therefore 300d. + 180d. + 120d. = 600d.$

$600d. \div (26\frac{2}{3} \times \frac{105d.}{2}) = \frac{2}{3}$.

- 1) Area of room = $(19 \times 17) \text{ sq. ft.} = 323 \text{ sq. ft.}$

Area covered = $\frac{\text{£}10 \text{ } 15s. \text{ } 3d.}{4s. \text{ } 6d.} \times \frac{2}{1} \times \frac{2}{3} = 287 \text{ sq. ft.}$

\therefore area left uncovered = $(323 - 287) \text{ sq. ft.} = 36 \text{ sq. ft.}$

Length round the room = $2(19 + 17) \text{ ft.} = 72 \text{ ft.}$

\therefore width left uncovered = $\frac{36}{72} \text{ ft.} = \frac{1}{2} \text{ ft.} = 6 \text{ in.}$

$$(52) \frac{7}{8} - \frac{1}{4} + \frac{3}{4} - \frac{1}{3} = \frac{42 - 20 - 36 + 32}{48} = \frac{18}{48}.$$

$$4 - \frac{153}{48} = \frac{48}{48}, \text{ and } 4 + \frac{153}{48} = \frac{342}{48}.$$

$$\text{Difference} = \frac{342}{48} - \frac{48}{48} = \frac{294}{48} \therefore \frac{294}{48} \div 20 = \frac{5}{16}.$$

$$(53) \text{ Number of planks } = (37\frac{1}{2} \times 13 \times 9 \times 144) \text{ sq. in.} \div (\frac{237}{4} \times 7\frac{1}{2}) \text{ sq. in.}$$

$$= \frac{134}{1} \times \frac{13}{1} \times \frac{9}{1} \times \frac{144}{1} \div \frac{237}{4} \times \frac{33}{2} = 334.$$

$$\text{Cost} = \frac{134}{1} \times \frac{13}{1} \times \frac{9}{1} = \frac{6045}{1} d = £12 \text{ 11s. } 10\frac{1}{2}d.$$

$$(54) \frac{\frac{121}{125} - \frac{30}{130 - \frac{25}{10}}}{4\frac{1}{2} - \frac{10}{45 - \frac{2}{25}}} = \frac{\frac{121}{125} - \frac{30}{130 - \frac{25}{10}}}{4\frac{1}{2} - \frac{10}{45 - \frac{2}{25}}} = \frac{\frac{121}{125} - \frac{30}{130 - \frac{25}{10}}}{4\frac{1}{2} - \frac{10}{45 - \frac{2}{25}}} = \frac{11}{25} - \frac{6}{25} = \frac{5}{25} = \frac{1}{5}.$$

$$(55) 7000 \text{ grs. Troy} = 1 \text{ lb. Av. Then } (\frac{160}{69} \times \frac{20288}{7000}) \div 56 = \frac{3}{5}.$$

$$\text{Cost of 11 oz.} = (£1333\frac{1}{3} \times 11 \text{ oz.}) \div \frac{1}{4} \text{ cwt.} = (£1333\frac{1}{3} \times 11 \times 20$$

$$\times 24 \text{ grs.}) \div (28 \times 7000 \text{ grs.}) = £\frac{1760}{49} = £35 \text{ 18s. } 4\frac{2}{3}d.$$

$$(56) 7\frac{8}{15} - \frac{7}{15} + 3\frac{2}{3} = 10 \frac{24 - 10 + 50}{75} = 10\frac{64}{75} \therefore 2\frac{1}{5} \div 10\frac{64}{75} = \frac{15}{74}.$$

$$\text{Remaining funds} = 1 - \frac{15}{74} \text{ or } \frac{59}{74} \therefore \frac{1}{3} \text{ of } \frac{59}{74} = \frac{59}{222} \text{ of his money re-}$$

$$\text{presents } £34 \text{ 7s. } 6d.$$

$$\therefore \text{sum invested} = £34\frac{2}{3} + \frac{59}{222} = \frac{81050}{473} = £129 \text{ 6s. } 10\frac{2}{3}d.$$

$$(57) (\frac{6}{1} \times \frac{67}{9} \times \frac{38}{3} \times \frac{8}{28} \times \frac{6}{95} = 12) - (\frac{3}{1} \times \frac{17}{7} \times \frac{13}{3} \times \frac{13}{39} \times \frac{2}{5} = 4) \therefore 12 - 4 = 8.$$

A, B, and C can do $\frac{1}{2}$ of work in 1 day.

A and C can do $\frac{1}{3}$ of work in 1 day.

\therefore B can do $\frac{1}{2} - \frac{1}{3}$ or $\frac{1}{6}$ in 1 day.

\therefore B can do the work in $\frac{6}{1}$ or 2 $\frac{2}{3}$ days.

$$(58) (\frac{61}{8} \times \frac{13}{2} \times \frac{4}{13} \times \frac{1}{17} = \frac{4}{17}) - (\frac{25}{7} \times \frac{7}{3} \times \frac{2}{25} \times \frac{3}{5} = \frac{2}{5}) \therefore \frac{4}{17} - \frac{2}{5} = \frac{7}{20}.$$

$$\frac{7}{20} \text{ of the flock cost } £1272 \text{ 19s.}$$

$$\therefore \text{the whole cost } \frac{20}{7} \times £1272 \text{ 19s.} = £3637.$$

EXERCISE XXXII., p. 52.

$$(1) \text{ i. } \frac{3}{10} = .3; \text{ ii. } \frac{19}{10} = 1.9; \text{ iii. } \frac{77}{100} = .77; \text{ iv. } \frac{119}{1000} = .119.$$

$$(2) \text{ i. } \frac{1027}{1000} = 1.027; \text{ ii. } \frac{1}{1000} = .001; \text{ iii. } \frac{36}{10000} = .0036; \text{ iv. } \frac{719}{10000} = .0719.$$

$$(3) \text{ i. } \frac{1267}{10000} = .1267; \text{ ii. } \frac{9}{100000} = .00009; \text{ iii. } \frac{17}{100000} = .00017;$$

$$\text{iv. } \frac{81723}{10000} = 8.1723.$$

EXERCISE XXXIII., p. 53.

- 1) i. $\cdot 9 = \frac{9}{10}$; ii. $\cdot 19 = \frac{19}{100}$; iii. $\cdot 025 = \frac{25}{1000} = \frac{1}{40}$; iv. $\cdot 85 = \frac{85}{100} = \frac{17}{20}$.
 2) i. $\cdot 0035 = \frac{35}{10000} = \frac{7}{2000}$; ii. $1\cdot 027 = 1\frac{27}{1000}$;
 iii. $11\cdot 5725 = 11\frac{5725}{10000} = 11\frac{229}{400}$; iv. $2\cdot 076125 = 2\frac{76125}{1000000} = 2\frac{609}{80000}$.
 3) i. $7\cdot 390625 = 7\frac{390625}{1000000} = 7\frac{25}{64}$; ii. $9\cdot 1953125 = 9\frac{1953125}{10000000} = 9\frac{25}{128}$;
 iii. $15\cdot 000025 = 15\frac{25}{1000000} = 15\frac{1}{40000}$;
 iv. $7\cdot 000125 = 7\frac{125}{1000000} = 7\frac{1}{8000}$.

EXERCISE XXXIV., p. 53.

- 1) i. $\frac{5}{8} = \cdot 625$; ii. $\frac{9}{16} = \cdot 5625$; iii. $\frac{8}{128} = \cdot 072$; iv. $\frac{54}{128} = \cdot 432$
 v. $\frac{3}{40} = \cdot 075$; vi. $\frac{13}{128} = \cdot 1015625$.
 2) i. $\frac{7}{5} = 1\cdot 4$; ii. $\frac{13}{50} = \cdot 26$; iii. $\frac{11}{2500} = \cdot 0444$; iv. $\frac{97}{3125} = \cdot 03104$.
 3) i. $\frac{519}{512} = 1\cdot 013671875$; ii. $\frac{1212}{8400} = \cdot 189375$; iii. $7\frac{15}{96} = 7\cdot 15625$;
 iv. $\frac{1}{1024} = \cdot 0009765625$.
 4) i. $14\frac{1131}{8125} = 14\cdot 0144768$; ii. $7\frac{303}{4096} = 7\cdot 073974609375$.
 5) i. $\frac{343803}{31250} = 11\cdot 001696$; ii. $\frac{625}{20480} = \cdot 030517578125$.
 6) i. $\frac{15\frac{1}{2}}{9\frac{1}{2}} + \frac{22}{32} = (\frac{76}{8} \times \frac{2}{19}) + (\frac{22}{32} \times \frac{3}{11}) = \frac{8}{8} + \frac{6}{25} = \frac{46}{25} = 1\cdot 84$;
 ii. $\frac{3}{7}$ of $\frac{7}{1600} = \frac{3}{1600} = \cdot 001875$.
 7) $5\frac{1}{2}$ of $4\frac{1}{9}$ of $\frac{81}{121}$ of $\frac{11}{64} = \frac{323}{128} = 2\cdot 6015625$.

EXERCISE XXXV., p. 53.

- 1) i. $\frac{1}{3} = 3\cdot 6$; ii. $1\frac{2}{3} = 1\cdot 285714$; iii. $\frac{73}{38} = 2\cdot 027$; iv. $2\frac{1}{13} = 2\cdot 076923$.
 2) i. $\frac{1}{111} = \cdot 009$; ii. $\frac{121}{33} = 3\cdot 6$; iii. $\frac{514}{1605} = \cdot 3087$;
 iv. $\frac{51}{63} = \cdot 8225806451612903$.
 3) i. $\frac{42}{111} = \cdot 0378$; ii. $\frac{8100}{7000} = 1\cdot 1571428$; iii. $1\frac{29}{60} = 1\cdot 483$;
 iv. $\frac{72}{85} = 1\cdot 1076923$.
 4) i. $3\frac{1}{21} = 3\cdot 047619$; ii. $\frac{67}{33} = 2\cdot 03$.
 iii. $\frac{1}{41} = \cdot 02439$; iv. $\frac{1}{43} = \cdot 023255813953488372093$.
 5) i. $\frac{1}{48} = \cdot 020408163265306122448979591836734693877551$;
 ii. $\frac{1}{53} = \cdot 0188679245283$; iii. $\frac{7}{8} = \cdot 714285$;
 iv. $\frac{1}{131} = \cdot 0082644628099173553719$.

EXERCISE XXXVI., p. 54.

$$(1) \text{ i. } 6 = \frac{6}{1} = \frac{2}{1}; \text{ ii. } 27 = \frac{27}{1} = \frac{3}{1}; \text{ iii. } 36 = \frac{36}{1} = \frac{4}{1}; \text{ iv. } 296 = \frac{296}{1} = \frac{5}{1};$$

$$(2) \text{ i. } 2 \cdot 126 = 2 \frac{126-1}{990} = 2 \frac{125}{990} = 2 \frac{25}{198};$$

$$\text{ii. } 3 \cdot 212 = 3 \frac{212-2}{990} = 3 \frac{210}{990} = 3 \frac{7}{33};$$

$$\text{iii. } 037 = \frac{37}{999} = \frac{1}{27}; \text{ iv. } 2567 = \frac{2567-2}{9990} = \frac{2565}{9990} = \frac{12}{74}.$$

$$(3) \text{ i. } 4684 = \frac{4684-4}{9990} = \frac{4680}{9990} = \frac{52}{111}; \text{ ii. } 571428 = \frac{571428-4}{999999} = \frac{4}{7};$$

$$\text{iii. } 2 \cdot 765142 = 2 \frac{765142-7}{999990} = 2 \frac{765135}{999990} = 2 \frac{17003}{22222};$$

$$\text{iv. } 1 \cdot 50675 = 1 \frac{50675-50}{99900} = 1 \frac{50625}{99900} = 1 \frac{75}{144}.$$

$$(4) \text{ i. } 843834 = \frac{843834-84}{99900} = \frac{843750}{99900} = \frac{1875}{222};$$

$$\text{ii. } 253127 = \frac{253127-2}{999990} = \frac{253125}{999990} = \frac{5625}{22222};$$

$$\text{iii. } 4 \cdot 6874 = 4 \frac{6874-6}{9990} = 4 \frac{6868}{9990} = 4 \frac{4334}{4995};$$

$$\text{iv. } 2 \cdot 428571 = 2 \frac{428571-2}{999999} = 2 \frac{1}{3}.$$

$$(5) \text{ i. } 2 \cdot 174603 = 2 \frac{174603-2}{999999} = 2 \frac{11}{83};$$

$$\text{ii. } 3 \cdot 2142857 = 3 \frac{2142857-2}{9999990} = 3 \frac{2142855}{9999990} = 3 \frac{3}{14};$$

$$\text{iii. } 6 \cdot 3571428 = 6 \frac{3571428-3}{9999990} = 6 \frac{3571425}{9999990} = 6 \frac{5}{14};$$

$$\text{iv. } 1076923 = \frac{1076923-1}{9999990} = \frac{1076922}{9999990} = \frac{7}{85}.$$

EXERCISE XXXVII., p. 54.

$$(1) 35 \cdot 79055.$$

$$(2) 192 \cdot 709.$$

$$(3) 26 \cdot 86079.$$

$$(4) 163 \cdot 911647.$$

$$(5) 27 \cdot 622776.$$

$$(6) 1 \cdot 96538; \cdot 964132.$$

$$(7) 2 \cdot 58611; 11 \cdot 445.$$

$$(8) \cdot 22765; \cdot 00775,$$

$$(9) \cdot 00059083; \cdot 0001.$$

$$(10) \cdot 013333; 1 \cdot 2109.$$

EXERCISE XXXVIII., p. 55.

$$\begin{array}{r} \text{(1)} \quad 1 \cdot 125555 \mid 5555555 \\ 7 \cdot 438628 \mid 6286286 \\ \quad \cdot 126573 \mid 1265731 \\ 9 \cdot 567777 \mid 7777777 \\ 2 \cdot 876576 \mid 5765765 \\ \hline 21 \cdot 135111 \mid 6651114 \end{array}$$

$$\begin{array}{r} \text{(2)} \quad 7 \cdot 261616 \mid 161616161 \\ \quad \cdot 729729 \mid 729729729 \\ \quad \quad 5 \cdot 25 \\ 11 \cdot 647859 \mid 647859647 \\ 1 \cdot 727272 \mid 727272727 \\ \quad \cdot 666666 \mid 666666666 \\ \hline 27 \cdot 283144 \mid 933144930 \end{array}$$

$$\begin{array}{r} \text{(3)} \quad 7 \cdot 6363636 \mid 3636363636 \\ \quad \cdot 9854329 \mid 854329854329 \\ \quad \cdot 3333333 \mid 333333333333 \\ 8 \cdot 2546 \mid \\ 9 \cdot 7297297 \mid 297297297297 \\ \quad \cdot 6666666 \mid 666666666666 \\ \quad \cdot 1543145 \mid \\ 2 \cdot 9649649 \mid 649649649649 \\ \quad \cdot 7185427 \mid 185427185427 \\ 64 \mid \\ \hline 95 \cdot 4439485 \mid 350340350337 \end{array}$$

$$\begin{array}{r} \text{(4) i.} \quad 1 \cdot 2979 \mid 797979 \\ \quad \cdot 6854 \mid 685468 \\ \hline \quad \cdot 6125 \mid 112511 \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \cdot 789265 \mid 789265 \\ \quad \cdot 333333 \mid 333333 \\ \hline \quad \cdot 455932 \mid 455932 \end{array}$$

$$\begin{array}{r} \text{(5) i.} \quad \cdot 545454 \mid 5454545 \\ \quad \cdot 239657 \mid 2396572 \\ \hline \quad \cdot 305897 \mid 3058973 \end{array}$$

$$\begin{array}{r} \text{ii.} \quad \cdot 25 \mid \\ \quad \cdot 248 \mid 4848 \\ \hline \quad \cdot 001 \mid 5152 \end{array}$$

$$\begin{array}{r} \text{(6) i.} \quad 34 \cdot 397241 \mid 397241 \\ 21 \cdot 424242 \mid 424242 \\ \hline 12 \cdot 972998 \mid 972999 \end{array}$$

$$\begin{array}{r} \text{ii.} \quad 217 \cdot 11 \mid \\ 107 \cdot 285714 \mid 285714 \\ \hline 109 \cdot 824285 \mid 714286 \end{array}$$

EXERCISE XXXIX., p. 56.

$$\begin{array}{r} \text{(1) i.} \quad 1 \cdot 74 \\ \quad \quad 1 \cdot 2 \\ \hline \quad \quad 348 \\ \quad \quad 174 \\ \hline 2 \cdot 088 \end{array}$$

$$\begin{array}{r} \text{ii.} \quad 9 \cdot 72 \\ \quad \quad 1 \cdot 12 \\ \hline \quad \quad 1944 \\ \quad \quad 972 \\ \hline \quad \quad 972 \\ \hline 10 \cdot 8864 \end{array}$$

$$\begin{array}{r}
 (2) \text{ i. } 9 \cdot 673 \\
 \quad \cdot 021 \\
 \hline
 \quad 9673 \\
 19346 \\
 \hline
 \cdot 203133
 \end{array}$$

$$\begin{array}{r}
 \text{ii. } 79 \cdot 81 \\
 \quad 6 \cdot 19 \\
 \hline
 \quad 71829 \\
 \quad 7981 \\
 \hline
 \quad 47886 \\
 \hline
 494 \cdot 0239
 \end{array}$$

$$\begin{array}{r}
 (3) \text{ i. } \cdot 0092 \\
 \quad \cdot 167 \\
 \hline
 \quad 644 \\
 \quad 552 \\
 \quad 92 \\
 \hline
 \cdot 0016364
 \end{array}$$

$$\begin{array}{r}
 \text{ii. } 9872 \cdot 06 \\
 \quad 514 \\
 \hline
 \quad 3948824 \\
 \quad 987206 \\
 \hline
 \quad 4936030 \\
 \hline
 5074238 \cdot 84
 \end{array}$$

$$\begin{array}{r}
 (4) \text{ i. } 86 \cdot 54 \\
 \quad \cdot 00017 \\
 \hline
 \quad 60578 \\
 \quad 8654 \\
 \hline
 \cdot 0147118
 \end{array}$$

$$\begin{array}{r}
 \text{ii. } \cdot 07852 \\
 \quad 1 \cdot 99 \\
 \hline
 \quad 70668 \\
 \quad 70668 \\
 \hline
 \quad 7852 \\
 \hline
 \cdot 1562548
 \end{array}$$

$$\begin{array}{r}
 (5) \text{ i. } \cdot 001976 \\
 \quad 1400 \\
 \hline
 \quad 790400 \\
 \quad 1976 \\
 \hline
 2 \cdot 766400
 \end{array}$$

$$\begin{array}{r}
 \text{ii. } \cdot 003 \\
 \quad 17 \\
 \hline
 \quad 21 \\
 \quad 3 \\
 \hline
 \quad \cdot 051 \\
 \quad \cdot 027 \\
 \hline
 \quad 357 \\
 \quad 102 \\
 \hline
 \cdot 001377 \\
 \quad 5000 \\
 \hline
 6 \cdot 885000
 \end{array}$$

i.	18·72	ii.	·016
	<u>·0114</u>		<u>·011</u>
	7488		16
	1872		16
	<u>1872</u>		<u>·000176</u>
	·213408		720
	<u>·00003</u>		3520
	·00000640224		1232
	70000		<u>·126720</u>
	<u>·44815680000</u>		·005
			<u>·00063360</u>
			9000
			<u>5·7024000</u>

EXERCISE XL., p. 57.

i. ·75) 9·375 (12·5	ii. ·0625) 390·625 (6250
<u>75</u>	<u>3750</u>
187	<u>1562</u>
<u>150</u>	1250
375	<u>3125</u>
<u>375</u>	3125
...

i. ·00192) 854·2296 (444911·25	ii. ·0048) 921·6 (192000
<u>768</u>	<u>48</u>
862	441
<u>768</u>	432
942	96
<u>768</u>	96
1749	..
<u>1728</u>	
216	
<u>192</u>	
240	
<u>192</u>	
480	
<u>384</u>	
960	
<u>960</u>	
...	

(3) i. 405) 59·049 (·1458

$$\begin{array}{r}
 405 \\
 \hline
 1354 \\
 1620 \\
 \hline
 2349 \\
 2025 \\
 \hline
 3240 \\
 3240 \\
 \hline
 \dots
 \end{array}$$

ii. ·000128) 262·144 (2048000

$$\begin{array}{r}
 256 \\
 \hline
 614 \\
 512 \\
 \hline
 1024 \\
 1024 \\
 \hline
 \dots
 \end{array}$$

(4) i. 00245) 11764·9 (4802000

$$\begin{array}{r}
 980 \\
 \hline
 1964 \\
 1960 \\
 \hline
 490 \\
 490 \\
 \hline
 \dots
 \end{array}$$

ii. 10) ·0040

$$\begin{array}{r}
 \hline
 \cdot 0004
 \end{array}$$

(5) i. ·0004) 16

$$\begin{array}{r}
 \hline
 40000
 \end{array}$$

ii. ·0256) 9·216 (360

$$\begin{array}{r}
 768 \\
 \hline
 1536 \\
 1536 \\
 \hline
 \dots
 \end{array}$$

(6) i. 144·5) 83·521 (·578

$$\begin{array}{r}
 7225 \\
 \hline
 11271 \\
 10115 \\
 \hline
 11560 \\
 11560 \\
 \hline
 \dots
 \end{array}$$

ii. ·00338) 3·825809 (1131·896 &c.

$$\begin{array}{r}
 338 \\
 \hline
 445 \\
 338 \\
 \hline
 1078 \\
 1014 \\
 \hline
 640 \\
 338 \\
 \hline
 3029 \\
 2704 \\
 \hline
 3250 \\
 3042 \\
 \hline
 2080 \\
 2028 \\
 \hline
 52
 \end{array}$$

i. 62.5) 7.50 (.12

$$\begin{array}{r} 625 \\ \hline 1250 \\ 1250 \\ \hline \end{array}$$

ii. .0012) 8.042292 (6701.91

$$\begin{array}{r} 72 \\ \hline 84 \\ 84 \\ \hline 22 \\ 12 \\ \hline 109 \\ 108 \\ \hline 12 \\ 12 \\ \hline .. \end{array}$$

i. .000000125) 12.65 (101200000

$$\begin{array}{r} 125 \\ \hline 150 \\ 125 \\ \hline 250 \\ 250 \\ \hline ... \end{array}$$

ii. 73) .28398241 (.00389017

$$\begin{array}{r} 219 \\ \hline 649 \\ 584 \\ \hline 658 \\ 657 \\ \hline 124 \\ 73 \\ \hline 511 \\ 511 \\ \hline ... \end{array}$$

i. .00073) 2839.82410 (3890170

$$\begin{array}{r} 219 \\ \hline 649 \\ 584 \\ \hline 658 \\ 657 \\ \hline 124 \\ 73 \\ \hline 511 \\ 511 \\ \hline ... \end{array}$$

ii. 976) .952576 (.000976

$$\begin{array}{r} 8784 \\ \hline 7417 \\ 6832 \\ \hline 5856 \\ 5856 \\ \hline \end{array}$$

(10) i. 000000164) 26896 (164000000 ii. 479) 229441 (000479

<u>164</u>	<u>1916</u>
1049	3784
984	3353
<u>656</u>	<u>4311</u>
656	4311
<u>...</u>	<u>....</u>

(11) 00175) 940 (537142857142

<u>875</u>
650
525
<u>1250</u>
1225
<u>250</u>
175
<u>750</u>
700
<u>500</u>
350
<u>1500</u>
1400
<u>1000</u>
875
<u>1250</u>
1225
<u>250</u>
175
<u>750</u>
700
<u>500</u>
350
<u>150</u>

EXERCISE XLI., p. 58.

$$1) \text{ i. } \left. \begin{array}{l} 4\cdot3 = 4\frac{3}{10} = 4\frac{1}{3} \text{ or } \frac{13}{3} \\ \cdot 27 = \frac{27}{100} \text{ or } \frac{3}{11} \end{array} \right\} \therefore \frac{13}{3} \times \frac{3}{11} = \frac{13}{11} \text{ or } 1\cdot18.$$

$$\text{ii. } \left. \begin{array}{l} 5\cdot72 = 5\frac{72}{100} = 5\frac{8}{11} \text{ or } \frac{63}{11} \\ \cdot 174603 = \frac{174603}{999999} \end{array} \right\} \therefore \frac{63}{11} \times \frac{174603}{999999} = 1.$$

$$2) \text{ i. } \begin{array}{r} 2\cdot657821 \overline{) 65} \\ \underline{\cdot 15} \\ 13289108 \overline{) 28} \\ 26578216 \overline{) 57} \\ \hline 39867324 \overline{) 85} \end{array}$$

$$\text{ii. } \begin{array}{r} 1\cdot267952 \overline{) 26} \\ \underline{4\cdot 2} \\ 2535904 \overline{) 53} \\ 50718090 \overline{) 71} \\ \hline 5\cdot 3263995 \overline{) 24} \end{array}$$

$$) \text{ i. } \begin{array}{r} \frac{571428}{999999} = \frac{4}{7} \\ \therefore \frac{4}{7} \times \frac{1764}{1} = 1008. \end{array}$$

$$\text{ii. } \begin{array}{r} \cdot 865472 \overline{) 865} \\ \underline{54\cdot 67} \\ 6058310 \overline{) 057} \\ 51928371 \overline{) 928} \\ 346189146 \overline{) 188} \\ 4327364327 \overline{) 364} \\ \hline 47\cdot 31540155 \overline{) 537} \end{array}$$

$$\text{ i. } \begin{array}{r} \cdot 1654327 \overline{) 32} \\ \underline{157} \\ 11580291 \overline{) 28} \\ 82716366 \overline{) 36} \\ 165432732 \overline{) 73} \\ \hline 25\cdot 9729390 \overline{) 37} \end{array}$$

$$\text{ii. } \begin{array}{r} \cdot 876549 \overline{) 876} \\ \underline{90\cdot 6} \\ 5259299 \overline{) 259} \\ 788894888 \overline{) 894} \\ \hline 79\cdot 4154188 \overline{) 153} \end{array}$$

$$) \text{ i. } \begin{array}{r} \cdot 854321 \overline{) 85} \\ \underline{1122} \\ 1708643 \overline{) 70} \\ 17086437 \overline{) 08} \\ 85432185 \overline{) 43} \\ 854321854 \overline{) 32} \\ \hline 958\cdot 549120 \overline{) 53} \end{array}$$

$$\text{ii. } \frac{296}{999} \div \frac{37}{999} = \frac{296}{999} \times \frac{999}{37} = 8.$$

$$6) \text{ i. } \left. \begin{array}{l} \cdot 2567 = \frac{2567-2}{9990} = \frac{2565}{9990} \\ \cdot 468 = \frac{468}{999} \end{array} \right\} \therefore \frac{2565}{9990} \times \frac{999}{468} = \frac{57}{104} = \cdot 548076923.$$

$$\text{ii. } \cdot 571428 = \frac{571428}{999999} \text{ or } \frac{4}{7} \therefore \frac{4}{7} \times \frac{7}{4} = \frac{147}{2} = 73\cdot 5.$$

(7) i. $40 + \frac{1}{100} - \frac{1}{10} \times \frac{1}{100} = 135$; ii. $3 = \frac{1}{2} \therefore 18 \div \frac{1}{2} = 18 \times 2 = 36$

(8) i. $\cdot 0070$ $\cdot 02930001$ ($\cdot 8643$) ii. $\cdot 042$ $\cdot 007715$ ($\cdot 221$)

228	84
666	137
608	126
489	114
456	84
380	305
304	294
261	11
228	
88	

(9) i. $\cdot 0824$ $\cdot 40040563$ ($12\cdot 5461$) ii. $1\cdot 571428 = 1\frac{4}{7}$
 $\therefore 7 \div 1\frac{4}{7} = \frac{7}{1} \times \frac{7}{11} = \frac{49}{11}$ or

824
 824
 648
 1700
 1020
 1406
 1206
 1006
 1044
 828
 324
 199

(10) i. $4\cdot 00 = 4\frac{0}{100} = 4\frac{1}{25}$ or $\frac{101}{25}$ } $\therefore \frac{49}{11} \times \frac{7}{18} = \frac{343}{198} = 2\cdot 54$;
 $1\cdot 714285 = 1\frac{5}{7}$ or $\frac{12}{7}$

ii. $\cdot 17 = \frac{17}{100}$ or $\frac{17}{100}$ } $\therefore \frac{5}{28} \times \frac{5}{22} = \frac{25}{616} = \cdot 04$.
 $4\cdot 80 = 4\frac{80}{100}$ or $4\frac{4}{5}$

EXERCISE XLII., p. 59.

(1) $\cdot 85$ of £1

20
 7⁰⁰0s.
 7s.

(2) $\cdot 125$ of £1

20
 2⁵⁰00s.
 12
 6⁰⁰d.
 2s. 6d.

(3) 2.45 of £1

$$\begin{array}{r} 20 \\ \hline 9.00s. \\ \hline £2\ 9s. \end{array}$$

(4) 12.75 of £10 =
 $£127.5 = £127\ 10s.$

(5) 3.275 of $3s. 4d.$, or $40d.$

$$\begin{array}{r} 40 \\ \hline 12) 131.000 \\ \hline 10.11 \\ \hline 10s. 11d. \end{array}$$

(6) 1.2825 of $16s. 8d.$, or $200d.$

$$\begin{array}{r} 200 \\ \hline 12) 256.5000 \\ \hline 2,0) 2,1.4\frac{1}{2} \\ \hline £1\ 1s. 4\frac{1}{2}d. \end{array}$$

(7) 5.8125 of £5

$$\begin{array}{r} 5 \\ \hline £29.0625 \\ \hline 20 \\ \hline 1.2500s. \\ \hline 12 \\ \hline 3.00d. \\ \hline £29\ 1s. 3d. \end{array}$$

(8) $.085625$ of £10

$$\begin{array}{r} £85625 \\ \hline 20 \\ \hline 17.12500s. \\ \hline 12 \\ \hline 1.500d. \\ \hline 17s. 1\frac{1}{2}d. \end{array}$$

(9) 2.125 of 6 gs. , or $126s.$

$$\begin{array}{r} 126 \\ \hline 12750 \\ \hline 4250 \\ \hline 2125 \\ \hline 267.750s. \\ \hline 12 \\ \hline 900d. \\ \hline £13\ 7s. 9d. \end{array}$$

(10) 4.88125 of £4 $6s. 8d.$, or $1040d.$

$$\begin{array}{r} 1040 \\ \hline 19525000 \\ \hline 488125 \\ \hline 12) 5076.50000 \\ \hline 2,0) 423.0\frac{1}{2}d. \\ \hline £21\ 3s. 0\frac{1}{2}d. \end{array}$$

(11) $.8125$ of 2 tons 4 cwt., or 44 cwt.

$$\begin{array}{r} 44 \\ \hline 32500 \\ \hline 32500 \\ \hline 35.7500\text{ cwt.} \\ \hline 4 \\ \hline 3.00\text{ qrs.} \\ \hline 1\text{ ton } 15\text{ cwt. } 3\text{ qrs.} \end{array}$$

(12) $.375$ of 1 qr. 14 lbs., or 42 lbs.

$$\begin{array}{r} 42 \\ \hline 750 \\ \hline 1500 \\ \hline 15.750 = 15\frac{1}{2}\text{ lbs.} \\ \hline 15\text{ lbs. } 12\text{ oz.} \end{array}$$

- (13)
- $\cdot 1725$
- of 1 m. 6 fur., or 14 fur.

$$\begin{array}{r}
 14 \\
 \hline
 6900 \\
 1725 \\
 \hline
 2 \cdot 4160 \text{ fur.} \\
 40 \\
 \hline
 16 \cdot 000 \text{ pls.} \\
 5\frac{1}{2} \\
 \hline
 8 \cdot 3 \text{ yds.} \\
 3 \\
 \hline
 9 \text{ ft.} \\
 12 \\
 \hline
 10 \cdot 8 \text{ in.}
 \end{array}$$

2 fur. 16 pls. 3 yds. 0 ft. $10\frac{1}{2}$ in.

- (14)
- $3 \cdot 275$
- of 1 yd. 2 ft.,

$$\begin{array}{r}
 5 \\
 \hline
 16 \cdot 375 \text{ ft.} \\
 12 \\
 \hline
 4 \cdot 500 \text{ in.} \\
 5 \text{ yds. 1 ft. } 4\frac{1}{2} \text{ in.}
 \end{array}$$

- (15)
- $\cdot 48225$
- of 4A. 2R., or 18R.

$$\begin{array}{r}
 18 \\
 \hline
 385800 \\
 48225 \\
 \hline
 8 \cdot 08060 \text{ rds.} \\
 40 \\
 \hline
 27 \cdot 2200 \text{ pls} \\
 30\frac{1}{2} \\
 \hline
 660 \\
 5\frac{1}{2} \\
 \hline
 6 \cdot 65\frac{1}{2} \text{ yds.} \\
 9 \\
 \hline
 5 \cdot 89\frac{1}{2} \text{ ft.} \\
 144 \\
 \hline
 428 \\
 356 \\
 89 \\
 \hline
 128 \cdot 88 \text{ in.}
 \end{array}$$

2A. 0R. 27 pls. 6 yds. 5 ft. $128\frac{11}{12}$ in.

- (16)
- $4 \cdot 125$
- of 24 sq. yds.

$$\begin{array}{r}
 24 \\
 \hline
 16500 \\
 8250 \\
 \hline
 99 \cdot 000 \text{ sq. yds.} \\
 99 \text{ sq. yds.}
 \end{array}$$

7) .028125 of 5 bus.

$$\begin{array}{r} 5 \\ \hline .140625 \text{ bus.} \end{array}$$

$$\begin{array}{r} 4 \\ \hline .562500 \text{ pks.} \end{array}$$

$$\begin{array}{r} 2 \\ \hline 1.1250 \text{ gals.} \end{array}$$

$$\begin{array}{r} 4 \\ \hline .500 \text{ qts.} \end{array}$$

$$\begin{array}{r} 2 \\ \hline 1.0 \text{ pt.} \end{array}$$

1 gal. 1 pt.

(18) 9.375 of 12 days.

$$\begin{array}{r} 12 \\ \hline 7) 112.500 \text{ days.} \end{array}$$

$$\begin{array}{r} 16.0\frac{1}{2} \\ \hline 16 \text{ wks. 0 days 12 hrs.} \end{array}$$

(19) 8.0375 of £20 3s. 4d., or 4840d.

$$\begin{array}{r} 4840 \\ \hline 3215000 \\ 643000 \\ 321500 \\ \hline \end{array}$$

12) 38901.5000d.

$$\begin{array}{r} 2,0) 324,1.9\frac{1}{2} \end{array}$$

£162 1s. 9½d.

(20) 28.3125 of £1 6s. 4d., or 316d.

$$\begin{array}{r} 316 \\ \hline 1578750 \\ 263125 \\ \hline 789375 \end{array}$$

12) 8314.7500d.

$$\begin{array}{r} 2,0) 69,2.10 \end{array}$$

£34 12s. 10½d.

(21) 17.375 of £2 0s. 4d., or 484d.

$$\begin{array}{r} 484 \\ \hline 69500 \\ 139000 \\ 69500 \\ \hline \end{array}$$

12) 8409.5000d.

$$\begin{array}{r} 2,0) 70,0.9\frac{1}{2} \end{array}$$

£35 0s. 9½d.

(22) 12.625 of £2 17s., or 57s.

$$\begin{array}{r} 57 \\ \hline 88375 \\ 63125 \\ \hline 719.625s. \end{array}$$

$$\begin{array}{r} 12 \\ \hline 7.500d. \end{array}$$

£35 19s. 7½d.

(23) 7.175 of 5s. 4d., or 64d.

$$\begin{array}{r} 64 \\ \hline 28700 \\ 43050 \\ \hline \end{array}$$

12) 459.2000d.

$$\begin{array}{r} 2,0) 3,8.3\frac{1}{2} \end{array}$$

£1 18s. 3½d.

(24) 8.375 of 8 gs., or 168s.

$$\begin{array}{r} 168 \\ \hline 67000 \\ 50250 \\ 8375 \\ \hline \end{array}$$

2,0) 140,7.000s.

£70 7s.

(25)	$\begin{array}{r} \text{£} \cdot 75 \\ 20 \\ \hline 15 \cdot 00s. \end{array}$	$\begin{array}{r} \cdot 125s. \\ 12 \\ \hline 1 \cdot 500d. \end{array}$	$\begin{array}{r} \cdot 15 \text{ of } 1 \text{ crown.} \\ 5 \\ \hline \cdot 75s. \\ 12 \\ \hline 9 \cdot 00d. \end{array}$
------	--	--	---

$$\text{Sum} = 15s. + 1\frac{1}{2}d. + 9d. = 15s. 10\frac{1}{2}d.$$

(26)	$\begin{array}{r} \text{£} \cdot 75625 \\ 20 \\ \hline 15 \cdot 12500s. \\ 12 \\ \hline 1 \cdot 500s. \end{array}$	$\begin{array}{r} \cdot 375 \text{ of } 2s. 6d., \text{ or } 30d. \\ 30 \\ \hline 11 \cdot 250d. \end{array}$	$\begin{array}{r} \cdot 75 \text{ of } \text{£}1 \text{ } 10s., \text{ or } 30s. \\ 30 \\ \hline 22 \cdot 50s. \end{array}$
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$$\text{Sum} = 15s. 1\frac{1}{2}d. + 11\frac{1}{4}d. + \text{£}1 \text{ } 2s. 6d. = \text{£}1 \text{ } 18s. 6\frac{1}{4}d.$$

(27)	$\begin{array}{r} 10 \cdot 125 \text{ of } 8d. \\ 8 \\ \hline 12) 81 \cdot 000 \\ \hline 6s. 9d. \end{array}$	$\begin{array}{r} \cdot 4325 \text{ of } 16s. 8d., \text{ or } 200d. \\ 200 \\ \hline 86 \cdot 5000d. \\ 7s. 2\frac{1}{2}d. \end{array}$	$\begin{array}{r} \cdot 75 \text{ of } 1 \text{ g., or } 21 \\ 21 \\ \hline 75 \\ 150 \\ \hline 15 \cdot 75s. = 15s. 9d. \end{array}$
------	---	--	---

$$\text{Sum} = 6s. 9d. + 7s. 2\frac{1}{2}d. + 15s. 9d. = \text{£}1 \text{ } 9s. 8\frac{1}{2}d.$$

(28)	$\begin{array}{r} \cdot 7625 \text{ of } \text{£}4 \\ 4 \\ \hline \text{£}3 \cdot 0500 \\ 20 \\ \hline 1 \cdot 00s. \end{array}$	$\begin{array}{r} 3 \cdot 75 \text{ of } 7 \text{ gs., or } 147s. \\ 147 \\ \hline 2625 \\ 1500 \\ \hline 375 \\ 551 \cdot 25s. = 551\frac{1}{4}s. \\ \text{£}27 \text{ } 11s. 3d. \end{array}$	$\begin{array}{r} 8 \cdot 25 \text{ of } 35s. \\ 35 \\ \hline 4125 \\ 2475 \\ \hline 288 \cdot 75s. = 288\frac{3}{4}s. \\ \text{£}14 \text{ } 8s. 9d. \end{array}$
------	--	---	--

$$\text{Sum} = \text{£}3 \text{ } 1s. + \text{£}27 \text{ } 11s. 3d. - \text{£}14 \text{ } 8s. 9d. = \text{£}16 \text{ } 3s. 6d.$$

(29)	$\begin{array}{l} \cdot 125 = \frac{125}{1000}, \text{ or } \frac{1}{8}. \\ \text{mils. fur. pls. yds. ft. in.} \\ 8) \begin{array}{cccccc} 3 & 6 & 24 & 4 & 2 & 4 \end{array} \\ \hline \begin{array}{cccccc} 3 & 33 & 0 & 1 & 9\frac{1}{2} \end{array} \end{array}$
------	---

(30)	$\begin{array}{l} \cdot 375 = \frac{375}{1000}, \text{ or } \frac{3}{8}. \\ \text{A. R. pls. yds. ft. in.} \\ \begin{array}{cccccc} 2 & 2 & 20 & 4 & 3 & 8 \end{array} \\ \hline \begin{array}{cccccc} & & & & 3 & \end{array} \\ 8) \begin{array}{cccccc} 7 & 3 & 20 & 13 & 0 & 24 \end{array} \\ \hline \begin{array}{cccccc} 3 & 37 & 16 & 6 & 111 \end{array} \end{array}$
------	--

$$3.45 = 3\frac{9}{20}$$

qrs.	lbs.	oz.	drs.
2	4	8	2
			9

$$\begin{array}{r} 0) \ 19 \ 12 \ 9 \ 2 \\ \hline 27 \ 3 \ 10\frac{1}{2} \\ 6 \ 13 \ 8 \ 6 \\ \hline 7 \ 12 \ 12 \ 0\frac{1}{2} \end{array}$$

$$(32) \ 1.75 = 1\frac{3}{4} \text{ or } \frac{7}{4}$$

oz.	dwt.	grs.
4	8	6
		7

$$\begin{array}{r} 4) \ 30 \ 17 \ 18 \\ \hline 7 \ 14 \ 10\frac{1}{2} \end{array}$$

$$\begin{array}{r} 1825 \text{ grs.} \\ 5.92 \\ \hline 3650 \\ 16425 \\ 9125 \end{array}$$

$$20) \ 10804.00 \text{ grs.}$$

$$3) \ 540.4$$

$$8) \ 180$$

$$12) \ 22.4$$

1 lb. 10 oz. 4 drs. 4 grs.

$$(34) \quad 893650 \text{ sec.}$$

$$4.62$$

$$1787300$$

$$5361900$$

$$3574600$$

$$6,0) \ 412866,300 \text{ sec.}$$

$$6,0) \ 6881,1.3$$

$$24 \left\{ \begin{array}{l} 6) \ 1146.51 \\ 4) \ 191.0 \\ 7) \ 47.3 \end{array} \right\} 18$$

6 wks. 5 hrs. 18 dys.

51 min. 3 sec.

$$1.56d.$$

$$1010$$

$$1560$$

$$156$$

$$12) \ 1575.60d.$$

$$2,0) \ 13,1.3$$

£6 11s. 3 $\frac{3}{4}$ d.

$$(36) \quad .526 \text{ pls.}$$

$$820$$

$$10520$$

$$4208$$

$$431.320 \text{ pls.}$$

$$5\frac{1}{2}$$

1.76 yds.

$$3$$

2.28 ft.

$$12$$

3.36 in.

1 m. 2 fur. 31 pls. 1 yd. 2 ft. 3 $\frac{3}{8}$ in.

(37) 1.36 pls.

$$\begin{array}{r}
 625 \\
 \hline
 680 \\
 272 \\
 \hline
 816 \\
 4,0) 85,000 \text{ pls.} \\
 \hline
 4) 21.10 \\
 \hline
 5\text{A. } 1\text{R. } 10\text{P.}
 \end{array}$$

(38) $2.75 = 2\frac{3}{4} \text{ or } \frac{11}{4}$

$$\begin{array}{r}
 \text{cwt. qrs. lbs.} \\
 2 \quad 2 \quad 25 \\
 \hline
 11 \\
 4) 29 \quad 3 \quad 23 \quad \text{oz.} \\
 \hline
 7 \quad 1 \quad 26 \quad 12
 \end{array}$$

$$\begin{array}{r}
 1.83\overline{3} \\
 6 \\
 \hline
 10.998s. = 11s.
 \end{array}$$

(40) $1.67 = \frac{167}{100} \text{ or } \frac{151}{90};$

$$\therefore \frac{151}{90} \times \frac{61}{1} = \frac{9211}{90} = £135 \frac{1}{2}$$

$$\begin{array}{r}
 6s. \ 1\frac{1}{2}d. \times 1\frac{1}{2} \\
 3 \\
 \hline
 2) \ 18.4\frac{1}{2} \\
 \hline
 9s. \ 2\frac{1}{4}d.
 \end{array}$$

(42) $1.76 = \frac{176}{100} \text{ or } \frac{53}{30};$

$$\therefore \frac{53}{30} \times \frac{75}{1} = \frac{3975}{2}d. = 11s. \ 0\frac{1}{2}d$$

$$\begin{array}{r}
 (43)^* \ 1.243\overline{24} \\
 37 \\
 \hline
 8702\overline{68} \\
 37297\overline{29} \\
 \hline
 45.999\overline{97}d. = 46d., \text{ or } 3s. \ 10d.
 \end{array}$$

$$\begin{array}{r}
 (44) \ 1.61904\overline{7}61 \\
 63 \\
 \hline
 4857142\overline{83} \\
 97142857\overline{14} \\
 \hline
 101.999999\overline{97} = 102 \text{ hl. p., c} \\
 4s. \ 3d.
 \end{array}$$

$$(45) \ 2.625 = 2\frac{5}{8} = \frac{21}{8} \times \frac{60}{1} = \frac{315}{2} = 157\frac{1}{2} \text{ lbs., or } 1 \text{ cwt. } 1 \text{ qr. } 17 \text{ lbs. } \frac{1}{8} \text{ or } \frac{1}{16}$$

$$\begin{array}{r}
 (46) \ 14.672\overline{7} \\
 165 \\
 \hline
 73363\overline{5} \\
 880363\overline{2} \\
 1467272\overline{7} \\
 \hline
 2420.999\overline{4} = 2421 \text{ hl. p.} \\
 \text{or } £5 \ 0s. \ 10\frac{1}{4}d.
 \end{array}$$

$$\begin{array}{r}
 (47) \ 14.69\overline{6} \\
 33 \\
 \hline
 4408\overline{8} \\
 44090\overline{7} \\
 \hline
 484.99\overline{5} = 485d. \\
 \text{or } 10s. \ 1\frac{1}{4}d.
 \end{array}$$

$$6 \cdot 9 = 1.$$

$$\begin{array}{r}
 3) \quad 1.0625 \\
 \underline{72} \\
 21250 \\
 \underline{74375} \\
 76.5000 = £76 \text{ 10s.}
 \end{array}$$

$$\begin{array}{r}
 (49) \quad 1.125 \overline{) } \\
 \underline{68} \\
 9000 \\
 \underline{6750} \\
 76.5000 = £76 \text{ 10s.}
 \end{array}$$

$$\begin{array}{r}
 1) \quad 2.76327 \\
 \underline{25} \\
 1381636 \\
 \underline{5526545} \\
 £69.081 \overline{) } 81 \\
 \underline{20} \\
 1.63 \text{ 63s.} \\
 \underline{12} \\
 7.6362d. = 7 \frac{7}{11}d. \\
 £69 \text{ 1s. } 7 \frac{7}{11}d.
 \end{array}$$

$$\begin{array}{r}
 (51) \quad 7.7954 \overline{) } 5 \\
 \underline{11} \\
 85.7499 \text{ 5s.} \\
 \underline{12} \\
 8.9988d. = 9d. \\
 £4 \text{ 5s. 9d.}
 \end{array}$$

$$\begin{array}{r}
 2) \quad .83428571 \overline{) } 4 \\
 \underline{175} \\
 417142857 \overline{) } 0 \\
 5839999999 \overline{) } 4 \\
 8342857142 \overline{) } 8 \\
 145.99999999 \overline{) } 2 = 146s. \\
 \text{or } £7 \text{ 6s.}
 \end{array}$$

$$\begin{array}{r}
 (53) \quad .45528 \overline{) } 4 \\
 \underline{205} \\
 227642 \overline{) } 0 \\
 9105691 \overline{) } 0 \\
 93.33333 \overline{) } 0 = 93 \frac{1}{3}s. \\
 £4 \text{ 13s. 4d.}
 \end{array}$$

$$\begin{array}{r}
 1) \quad 1.44583 \overline{) } 3 \\
 \underline{12} \\
 £17.34999 \overline{) } 6 = 17.35 \\
 \underline{20} \\
 7.00 \\
 £17 \text{ 7s. 0d.}
 \end{array}$$

$$\begin{array}{r}
 (55) \quad 3.714285 \overline{) } 714 \\
 \underline{13} \\
 11142857 \overline{) } 142 \\
 37142857 \overline{) } 142 \\
 £48.285714 \overline{) } 284 = £48 \frac{2}{7} \\
 £48 \text{ 5s. } 8 \frac{4}{7}d.
 \end{array}$$

$$\begin{array}{r}
 (56) \quad 1\cdot7307692\overline{)3} \\
 \underline{104} \\
 69230769 \\
 1730769230\overline{)7} \\
 \underline{179\cdot9999999} = 180s. \\
 \text{or } £9.
 \end{array}$$

$$\begin{array}{r}
 (57) \quad 12\cdot923076\overline{)9} \\
 \underline{195} \\
 64615384 \\
 1163076922 \\
 1292307692 \\
 \underline{2519\cdot999999} \overline{)6} = 2520d. \\
 \text{or 10 guineas.}
 \end{array}$$

$$\begin{array}{r}
 (58) \quad 14\cdot03\overline{)33} \\
 \underline{15} \\
 7016 \\
 14033 \\
 \underline{210\cdot49} = 210\cdot5 \text{ pts.} \\
 \text{or 3 bus. 1 pk. 1 qt. } \frac{1}{2} \text{ pt.}
 \end{array}$$

$$\begin{array}{r}
 (59) \quad 3656986531\overline{)9} \\
 \underline{45} \\
 18284932659 \\
 146279461279 \\
 \underline{16\cdot4564393938} \overline{)7} \text{ fur.} \\
 \underline{40} \\
 18\cdot25757 \text{ pls.} \\
 \underline{5\cdot5} \\
 128787 \\
 1287878 \\
 1\cdot416665 \text{ yds.} \\
 \underline{3} \\
 1\cdot249 = 1\cdot25 \text{ ft.} \\
 2 \text{ mls. 18 pls. 1 yd. 1 ft. 3 in.}
 \end{array}$$

$$\begin{array}{r}
 (60) \quad 0836538461\overline{)5} \\
 \underline{65} \\
 4182692307 \\
 50192307691 \\
 \underline{5\cdot4374999999} \overline{)3} \text{ oz.} \\
 \underline{8}
 \end{array}$$

$$\begin{array}{l}
 3\cdot49999 \text{ drs.} = 3\cdot50 \text{ or } 3\frac{1}{2} \text{ drs.} \\
 5 \text{ oz. 3 drs. 1 scr. 10 grs.}
 \end{array}$$

$$\begin{array}{l}
 (61) \quad 285714 = \frac{285714}{999999} \text{ or } \frac{2}{7}. \\
 \therefore \frac{2}{7} \times \frac{18}{1} = \frac{36}{7} \text{ rds.} \\
 1A. 1R. 5P. 21 \text{ yds. 5 ft. } 66\frac{2}{3} \text{ in.}
 \end{array}$$

$$(62) \quad \frac{238095}{999999} \times \frac{8865}{4} \text{ tons} = 527 \text{ tons 13 cwt. 2 qrs. 8 lbs.}$$

(63)

$$\begin{array}{r|l} .15416 & 6 \\ \hline 108 & \\ \hline 123332 & 8 \\ 1541666 & 6 \\ \hline 16.64999 & 4 \text{ wks.} \end{array}$$

$$\begin{array}{r} \text{or } .65 \\ \hline 7 \\ \hline 4.55 \text{ dys.} \\ 24 \\ \hline 220 \\ 110 \\ \hline 13.20 \text{ hrs.} \\ 60 \\ \hline 12.0 \text{ min.} \end{array}$$

(64)

$$\begin{array}{r|l} .11851 & 8 \\ \hline 15 & \\ \hline 59259 & 0 \\ 118518 & 5 \\ \hline 1.77777 & 6 \text{ qrs.} = 1\frac{7}{9} \text{ qr.} \end{array}$$

$$\text{or } 1 \text{ qr. } 3 \text{ nls. } \frac{1}{4} \text{ in.}$$

16 wks. 4 dys. 13 hrs. 12 min.

(65)

$$\begin{array}{r|l} .057954 & 545 \\ \hline 555 & \\ \hline 289772 & 725 \\ 2897727 & 272 \\ 28977272 & 725 \\ \hline 32.164772 & 722 \text{ fur.} \\ 40 & \end{array}$$

$$\begin{array}{r} 6.59090 \text{ pls.} \\ 5.5 \\ \hline \end{array}$$

$$\begin{array}{r} 2954 \\ 29545 \\ \hline \end{array}$$

$$3.2499 \text{ yds.} = 3.25 \text{ or } 3\frac{1}{4} \text{ yds.}$$

$$4 \text{ mls. } 6 \text{ pls. } 3 \text{ yds. } 9 \text{ in.}$$

$$(66) .428571 \text{ of } 22 \text{ cwt.} = \frac{3}{7} \times \frac{22}{1} = \frac{66}{7} \text{ cwt.} = 9 \text{ cwt. } 1 \text{ qr. } 20 \text{ lbs.}$$

$\frac{66}{7}$

EXERCISE XLIII., p. 61.

$$(1) \text{ i. } \begin{array}{r} 20) 7.500 \\ \underline{375} \end{array}$$

$$\text{ii. } 15 \left\{ \begin{array}{r} 5) 10.5 \\ \underline{3} 2.1 \\ 7 \end{array} \right.$$

$$(2) \text{ i. } 25 \left\{ \begin{array}{r} 5) 12.75 \\ \underline{5} 2.55 \\ 51 \end{array} \right.$$

$$\text{ii. } 12) 3.7500 \\ \underline{5} 2.3125 \\ 4625$$

$$(3) \text{ i. } \frac{7s. 10\frac{1}{2}d.}{15s. 9d.} = \frac{94.5}{189}d. = .5.$$

$$\text{ii. } 12) 1.500 \\ 100) 15.12500 \\ 15125$$

$$(4) \text{ i. } \begin{array}{r} 12) 8.2500 \\ 20) 3.6875 \\ 184375 \end{array}$$

$$\text{ii. } \begin{array}{r} 12) 9.75 \\ 50) 7.8125 \\ 15625 \end{array}$$

$$(5) \text{ i. } \frac{2s. 2\frac{1}{2}d.}{3s. 6d.} = \frac{26.25}{42}d. = .625$$

$$\text{ii. } 22 \left\{ \begin{array}{r} 11) 27.5 \\ \underline{2} 2.5 \\ 1.25 \end{array} \right.$$

$$(6) \text{ i. } \begin{array}{r} 12) 7.5 \\ 100) 49.625 \\ 49625 \end{array}$$

$$\text{ii. } \frac{\pounds 3 \text{ } 3s. \text{ } 3\frac{1}{2}d.}{\pounds 5 \text{ } 12s. \text{ } 6d.} = \frac{759.75}{1350}d. = .5627.$$

$$(7) \text{ i. } \begin{array}{r} 2) 1.5 \\ 2) 23.75 \\ 11.875 \end{array}$$

$$\text{ii. } 27 \left\{ \begin{array}{r} 3) 5.75 \\ \underline{9} 1.916 \\ 4) 5.21296 \\ 1.3032407 \end{array} \right.$$

$$(8)* \text{ i. } \frac{12 \text{ dwts. } 16\frac{1}{2} \text{ grs. Troy}}{8 \text{ oz. Av.}} = \frac{304.5}{3500} \text{ grs.} = .087.$$

$$\text{ii. } \frac{7 \text{ oz. } 2 \text{ dwts. } 18\frac{1}{2} \text{ grs. Troy}}{2\frac{1}{4} \text{ lbs. Av.}} = \frac{3426.125}{51} \text{ grs.} = .2175317460.$$

$$(9) \text{ i. } \begin{array}{r} 20) 17.50 \\ \underline{5} 2.875 \\ 575 \end{array}$$

$$\text{ii. } \begin{array}{r} 12) 6.5000 \\ 27 \left\{ \begin{array}{r} 3) 45.5416 \\ \underline{9} 15.1805 \\ 1.686728395061. \end{array} \right. \end{array}$$

* 7000 grs. Troy = 1 lb. Av.

(10) i. $12 \overline{) 6 \cdot 75}$

$$\begin{array}{r} 5,0 \overline{) 184 \cdot 5625} \\ 3 \cdot 69125 \end{array}$$

ii. $12 \overline{) 6 \cdot 5}$

$$\begin{array}{r} 5,0 \overline{) 75 \cdot 5416} \\ 1 \cdot 51083 \end{array}$$

(11) i. $12 \overline{) 5 \cdot 25}$

$$\begin{array}{r} 20 \overline{) 13 \cdot 4375} \end{array}$$

$$\begin{array}{r} 25 \left\{ \begin{array}{l} \overline{5) 7 \cdot 671875} \\ \overline{5) 1 \cdot 534375} \end{array} \right. \\ \cdot 306875 \end{array}$$

ii. $12 \overline{) 9 \cdot 5}$

$$\begin{array}{r} 24 \left\{ \begin{array}{l} \overline{6) 67 \cdot 7916} \\ \overline{4) 11 \cdot 29861} \end{array} \right. \\ 2 \cdot 8246527 \end{array}$$

(12) i. $16 \left\{ \begin{array}{l} \overline{4) 9 \cdot 25} \\ \overline{4) 2 \cdot 3125} \end{array} \right.$

$$\begin{array}{r} 28 \left\{ \begin{array}{l} \overline{4) 12 \cdot 578125} \\ \overline{7) 3 \cdot 14453125} \\ \overline{4) 2 \cdot 44921875} \end{array} \right. \end{array}$$

$$\begin{array}{r} 32 \left\{ \begin{array}{l} \overline{4) 8 \cdot 6123046875} \\ \overline{8) 2 \cdot 153076171875} \end{array} \right. \\ \cdot 269134521484375. \end{array}$$

ii. $\frac{6 \text{ lbs. } 14 \text{ oz. } 8 \text{ drs.}}{2 \text{ lbs. } 8 \text{ oz.}} = \frac{110 \cdot 5}{40} \text{ oz.} = 2 \cdot 7625$

(13) i. $\frac{\text{£}1 \text{ } 9\text{s. } 3\text{d.}}{\text{£}3 \text{ } 0\text{s. } 8\text{d.}} = \frac{351}{728} \text{d.} = \cdot 482142857.$

ii. $16 \left\{ \begin{array}{l} \overline{4) 9} \\ \overline{4) 2 \cdot 25} \end{array} \right.$

$$\begin{array}{r} 16 \left\{ \begin{array}{l} \overline{4) 13 \cdot 5625} \\ \overline{4) 3 \cdot 390625} \end{array} \right. \\ \cdot 84765625. \end{array}$$

(14) i. $16 \left\{ \begin{array}{l} \overline{4) 11} \\ \overline{4) 2 \cdot 75} \end{array} \right.$

$$\begin{array}{r} 16 \left\{ \begin{array}{l} \overline{4) 5 \cdot 6875} \\ \overline{4) 1 \cdot 421875} \end{array} \right. \end{array}$$

$$\begin{array}{r} 28 \left\{ \begin{array}{l} \overline{4) \cdot 35546875} \\ \overline{7) \cdot 0888671875} \end{array} \right. \end{array}$$

$$\begin{array}{r} 2) \cdot 0126953125 \\ \cdot 00634765625 \end{array}$$

ii. $\frac{\text{£}10 \text{ } 5\text{s. } 9\text{d.}}{\text{£}1 \text{ } 2\text{s. } 6\text{d.}} = \frac{205 \cdot 75}{22 \cdot 5} \text{d.} = 9 \cdot 14.$

15) i. $12) 6\cdot75$

$$16 \left\{ \begin{array}{l} 4) \underline{47\cdot5625} \\ 4) \underline{11\cdot890625} \\ 2\cdot97265625. \end{array} \right.$$

ii. $16 \left\{ \begin{array}{l} 4) \underline{15\cdot75} \\ 4) \underline{3\cdot9375} \end{array} \right.$

$$28 \left\{ \begin{array}{l} 4) \underline{984375} \\ 7) \underline{24609375} \\ 4) \underline{3\cdot03515625} \\ 2,0) \underline{4\cdot7587890625} \\ 237939453125 \end{array} \right.$$

16) i. $6\frac{3}{4}$ in. = $6\cdot75$ in., and $3\frac{1}{4}$ yds. = $3\cdot125$ yds.

$$\begin{array}{r} 12) \underline{6\cdot75} \\ 3) \underline{5625} \\ 3\cdot125) \underline{18750} \quad (06 \\ \underline{18750} \\ \dots \end{array}$$

ii. 2 nls. $1\frac{5}{8}$ in. = $6\cdot125$ in., and $\frac{1}{2}$ in. = $\cdot5$ in.

$$\begin{array}{r} \cdot5) \underline{6\cdot125} \\ 12\cdot25 \end{array}$$

(17) i. $\frac{60\frac{7}{8} \text{ dys.}}{\frac{5}{8} \text{ yrs.}} = \frac{228\cdot125}{\frac{5}{8} \times 365} \text{ dys.} = \frac{228\cdot125}{228\cdot125} \text{ dys.} = \cdot2668, \text{ \&c.}$

$$\begin{array}{r} \text{ii. } 9) \underline{2\cdot25} \\ 25 \left\{ \begin{array}{l} 5) \underline{24\cdot25} \\ 5) \underline{4\cdot85} \\ \cdot97 \end{array} \right. \end{array}$$

(18) i. $60) 2\cdot25$

$$\begin{array}{r} 60) \underline{0375} \\ 24 \left\{ \begin{array}{l} 4) \underline{000625} \\ 6) \underline{00015625} \\ 7) \underline{0000260416} \\ 000003720238095 \end{array} \right. \end{array}$$

ii. $12) 6\cdot75$

$$35 \left\{ \begin{array}{l} 5) \underline{119\cdot5625} \\ 7) \underline{23\cdot9125} \\ 3\cdot4160714285 \end{array} \right.$$

(19) i. $12) 5\cdot25$

$$\begin{array}{r} 2,0) \underline{8\cdot4375} \\ 16 \left\{ \begin{array}{l} 8) \underline{17\cdot421875} \\ 2) \underline{2\cdot177734375} \\ 1\cdot0888671875 \end{array} \right. \end{array}$$

ii. $12) 3\cdot75$

$$21 \left\{ \begin{array}{l} 3) \underline{7\cdot3125} \\ 7) \underline{2\cdot4375} \\ 3482142857 \end{array} \right.$$

$$(20) \text{ i. } 16 \left\{ \begin{array}{r} 4) 10 \cdot 25 \\ 4) 2 \cdot 5625 \\ \hline 640625 \end{array} \right.$$

$$\text{ii. } 16 \left\{ \begin{array}{r} 4) 15 \cdot 5 \\ 4) 3 \cdot 875 \\ \hline 28 \left\{ \begin{array}{r} 4) 12 \cdot 96875 \\ 7) 3 \cdot 2421875 \\ \hline 4631696428571 \end{array} \right. \end{array} \right.$$

$$(21) \text{ i. } 12) 8 \cdot 75 \\ 2,0) 14 \cdot 72916 \\ 3,0) 17 \cdot 7364583 \\ \hline 39121327$$

$$\text{ii. } 12) 6 \cdot 583 \\ 7,0) 55 \cdot 54861 \\ \hline 79355158730$$

$$(22) \text{ i. } 12) 11 \cdot 75 \\ 2,0) 19 \cdot 97916 \\ 8) 6 \cdot 9989583 \\ \hline 8748697916$$

$$\text{ii. } 12) 5 \cdot 75 \\ 1,00) 84 \cdot 47916 \\ \hline 8447916$$

$$(23) \text{ i. } \frac{£3 \text{ Os. } 6 \frac{3}{4} d.}{£8 \text{ ls. } 5 d.} = \frac{726 \cdot 375}{1937} d. = \cdot 375$$

$$\text{ii. } 12) 9 \cdot 75 \\ 2,00) 355 \cdot 8125 \\ \hline 1 \cdot 7790625$$

$$(24) \text{ i. } 12) 7 \cdot 75 \\ 12,0) 206 \cdot 64583 \\ \hline 1 \cdot 72204861$$

$$\text{ii. } 12) 2 \cdot 5 \\ 5,0) 57 \cdot 2083 \\ \hline 1 \cdot 14416$$

$$(25) \text{ } 16 \left\{ \begin{array}{r} 4) 13 \cdot 25 \\ 4) 3 \cdot 3125 \\ \hline 28 \left\{ \begin{array}{r} 4) 2 \cdot 828125 \\ 7) \cdot 70703125 \\ \hline 3) 2 \cdot 10100446428571 \\ \hline 70033482142857 \end{array} \right. \end{array} \right.$$

$$(26) \text{ } 16 \left\{ \begin{array}{r} 4) 12 \cdot 5 \\ 4) 3 \cdot 125 \\ \hline 28 \left\{ \begin{array}{r} 4) 20 \cdot 78125 \\ 7) 5 \cdot 1953125 \\ \hline 4) 3 \cdot 7421875 \\ \hline 20) 15 \cdot 935546875 \\ \hline 21 \left\{ \begin{array}{r} 3) \cdot 79677734375 \\ 7) \cdot 265592447916 \\ \hline 0379417782738096 \end{array} \right. \end{array} \right. \end{array} \right.$$

$$\begin{array}{rcl}
 7) \quad 16 \left\{ \begin{array}{l} \textcircled{4} \overline{6.75} \\ \textcircled{4} \overline{1.6875} \end{array} \right. & (28) \quad 3) \overline{1.5} & \\
 & \quad \quad \quad \underline{2.5} & \\
 & \quad \quad \quad \underline{2} & \\
 16 \left\{ \begin{array}{l} \textcircled{4} \overline{5.421875} \\ \textcircled{4} \overline{1.35546875} \end{array} \right. & 11) \overline{5.0} & \\
 & \quad \quad \quad \underline{4.0} \quad \quad \quad \underline{30.45} & \\
 28 \left\{ \begin{array}{l} \textcircled{4} \overline{5.3388671875} \\ \textcircled{7} \overline{1.334716796875} \end{array} \right. & 8) \overline{3.76136} & \\
 & \quad \quad \quad \underline{3) \overline{1.47017045}} & \\
 & \quad \quad \quad \underline{.49005681} & \\
 96 \left\{ \begin{array}{l} \textcircled{8} \overline{1.29766845703125} \\ \textcircled{12} \overline{.16220855712890625} \end{array} \right. & & \\
 & \quad \quad \quad \underline{.0135173797607421875} &
 \end{array}$$

$$\begin{array}{rcl}
 9) \quad 6,0) \overline{2.5} & (30) \quad 16 \left\{ \begin{array}{l} \textcircled{4} \overline{15.25} \\ \textcircled{4} \overline{3.8125} \end{array} \right. & \\
 24 \left\{ \begin{array}{l} \textcircled{4} \overline{14.0416} \\ \textcircled{6} \overline{3.510416} \\ \textcircled{7} \overline{4.5850694} \end{array} \right. & 16 \left\{ \begin{array}{l} \textcircled{4} \overline{15.953125} \\ \textcircled{4} \overline{3.98828125} \end{array} \right. & \\
 & 28 \left\{ \begin{array}{l} \textcircled{4} \overline{27.9970703125} \\ \textcircled{7} \overline{6.999267578125} \end{array} \right. & \\
 & \quad \quad \quad \underline{4) \overline{.999895368303571428}} & \\
 & 20) \overline{15.24997384207589285714} & \\
 & \quad \quad \quad \underline{8) \overline{7.7624986921037946428571}} & \\
 & \quad \quad \quad \underline{.9703123365129743303571428} &
 \end{array}$$

$$\begin{array}{rcl}
 1) \quad 9) \overline{7.5} & (32) \quad 24 \left\{ \begin{array}{l} \textcircled{4} \overline{16.3} \\ \textcircled{6} \overline{4.083} \end{array} \right. & \\
 & \quad \quad \quad \underline{12.83} & \\
 & \quad \quad \quad \underline{4} & \\
 21 \left\{ \begin{array}{l} \textcircled{11} \overline{51.33} \\ \textcircled{11} \overline{4.66} \end{array} \right. & \quad \quad \quad \underline{7) \overline{5.6805}} & \\
 & \quad \quad \quad \underline{4,0) \overline{13.42}} & \\
 & \quad \quad \quad \underline{8) \overline{6.33560}} & \\
 & \quad \quad \quad \underline{.79195075} &
 \end{array}$$

(33) $3 \overline{) 2.25}$

4.75

$\underline{2}$

$11 \overline{) 9.50}$

$4,0 \overline{) 35.863}$

$8 \overline{) 2.8965909}$

$\cdot 362073863$

(34) $12 \overline{) 7.3}$

$3 \overline{) 2.61}$

3.8703

$\underline{2}$

$11 \overline{) 7.7407}$

$4,0 \overline{) 37.7037}$

$8 \overline{) 5.94259}$

$21 \left\{ \begin{array}{l} 3 \overline{) 2.74282407} \\ 7 \overline{) .91427469135802} \end{array} \right.$

$\cdot 13061067019400352733686$

(35) $9 \overline{) 8.0}$

25.8

$\underline{4}$

$121 \left\{ \begin{array}{l} 11 \overline{) 107.5} \\ 11 \overline{) 9.7} \end{array} \right.$

$4,0 \overline{) 25.8}$

$12 \overline{) 11.6472}$

$\cdot 97060185$

EXERCISE XLIV., p. 63.

(1) i. $40 \overline{) 15.25}$

$\cdot 38125$

ii. $\cdot 95 \times 20s. = \frac{95}{100} \times \frac{20}{1} = 19s.$

$1.25 \times 1c. = 1\frac{1}{4} \times \frac{5}{1} = \frac{5}{4}s. = 6s. 3d.$

$\cdot 125 \times 6d. = \frac{125}{1000} \times \frac{6}{1} = \frac{3}{4}d.$

$\cdot 45 \times 11s. = \frac{45}{100} \times \frac{11}{1} = 5s.$

$\therefore \text{sum} = 19s. + 6s. 3d. + \frac{3}{4}d. - 5s. = \pounds 1 \text{ } 0s. 3\frac{3}{4}d.$

(2) i. $121 \left\{ \begin{array}{l} 11 \overline{) 2.00} \\ 11 \overline{) .18} \end{array} \right.$

$\cdot 0165289256198347107438$

ii. $101 \overline{) 7.00} \cdot 0693$

606

$\underline{940}$

909

$\underline{310}$

303

$\underline{7}$

iii. $\cdot 2207 = \frac{2207-2}{9990} = \frac{2205}{9990} = \frac{49}{222}$ iv. $\cdot 3900 = \frac{3900}{9999} = \frac{1300}{3333}$

3) i. $\cdot 2822265625$ qrs.

$$\begin{array}{r} 28 \\ \hline 22578125000 \\ 5644531250 \\ \hline 79023437500 \text{ lbs.} \end{array}$$

$$\begin{array}{r} 16 \\ \hline 541406250 \\ 90234375 \\ \hline 1443750000 \text{ oz.} \\ 16 \\ \hline 70000 \text{ drs.} \end{array}$$

Ans. 7 lbs. 14 oz. 7 drs.

ii. $12) 1\cdot5$

$$\begin{array}{r} 2,0) 2\cdot125 \\ \hline 5) 4\cdot10625 \\ \hline \cdot82125 \end{array}$$

4) i. $\frac{4}{33} = \cdot12;$

iii. $\cdot8712 = \frac{8712-87}{9900} = \frac{115}{132};$

ii. $\frac{5}{14} = \cdot3571428.$

iv. $\cdot9916 = \frac{9916-991}{9000} = \frac{8925}{9000} = \frac{119}{120}$

$\cdot7125$ of $13s. 4d.$, or $160d.$

$$\begin{array}{r} 160 \\ \hline 12) 114\cdot0000d. \\ \hline 9s. 6d. \end{array}$$

5) $\pounds 6 = \frac{6}{9} \times \frac{20}{1}s.$, or $13s. 4d.$; $\cdot27$ of $\pounds 1 13s. = \frac{27}{99}$ of $\frac{33}{1}s.$, or $9s.$; $2\cdot83$ of $8s. = \frac{275}{99}$ of $8s.$, or $\pounds 1 2s. 8d.$; $1\cdot25$ of $2s. 6d. = 1\frac{1}{4}$ of $2\frac{1}{2}$, or $3s. 1\frac{1}{2}d.$
 \therefore sum = $13s. 4d. + 9s. + \pounds 1 2s. 8d. - 3s. 1\frac{1}{2}d. = \pounds 2 1s. 10\frac{1}{2}d.$

6) $28 \left\{ \begin{array}{l} 4) 3\cdot5 \\ 7) \cdot875 \end{array} \right.$

$$\begin{array}{r} 4) 2\cdot125 \\ \hline 20) 4\cdot53125 \end{array}$$

$\cdot2265625.$

$(\pounds 625 \times 3\cdot83) + \cdot6\frac{625}{1000} \times 37\frac{5}{90} \times \frac{9}{8} = \pounds 11\frac{15}{32},$
 or $\pounds 3 11s. 10\frac{1}{2}d.$

(7) $\frac{7}{12} = \begin{array}{l} \cdot58333333 \\ \cdot28787878 \end{array}$

$11\frac{11}{24} = 11\cdot45833333$

$1\cdot34191919$

$\cdot325$

$\frac{1}{3} = \cdot33333333$

$6\cdot825$

$1\cdot25$

8) $22\cdot40479797$

$\frac{2}{280059974}$

$$\left. \begin{array}{l} (8) \cdot 006510416 \text{ of } £4 = 6\frac{1}{2}d. \\ \cdot 0015625 \text{ of } £20 = 7\frac{1}{2}d. \\ \cdot 013802083 \text{ of } £8 = 2s. 2\frac{1}{2}d. \end{array} \right\} \therefore \text{sum} = 3s. 4\frac{1}{2}d.$$

$$(9) \cdot 3571428 \text{ of } 1 \text{ ton} = \frac{3571428 - 3}{9999990} = \frac{3571425}{9999990} = \frac{5}{14} \text{ of } \frac{20}{1} = \frac{50}{7} \text{ cwt.} \\ = 7 \text{ cwt. } 16 \text{ lbs.}$$

$$\cdot 72 \text{ of } £1 \text{ } 2s. = \frac{72}{99} \text{ of } \frac{2}{1} = 16s.$$

$$1\cdot318 \text{ of } 1s. \text{ } 10d. = \frac{1318}{990} \text{ of } \frac{2}{1} = \frac{1305}{990} \times \frac{2}{1} = 29d. = 2s. \text{ } 5d.$$

$$\cdot 142857 \text{ of } 1 \text{ g.} = \frac{1}{7} \times \frac{21}{1} = 3s.$$

$$\therefore \text{sum} = 10s. + 2s. \text{ } 5d. - 3s., \text{ or } 15s. \text{ } 5d.$$

$$\frac{15s. \text{ } 5d.}{£10} = \frac{185}{2400}d. = \cdot 077083.$$

$$(10) \cdot 455877 = \frac{455877}{999999} = \frac{1369}{3003}, \quad \cdot 190476 = \frac{190476}{999999} = \frac{4}{21}.$$

$$\begin{array}{r} 28 \left\{ \begin{array}{l} (4) \ 5\cdot25 \\ (7) \ 1\cdot3125 \\ \hline 4) \ 2\cdot1875 \\ \hline 2,0) \ 5\cdot546875 \\ \hline \cdot 27734375. \end{array} \right. \end{array}$$

$$(11) \cdot 1083 \text{ of } £2 \text{ } 10s. = \frac{975}{9000} \text{ of } \frac{50}{1} = 5s. \text{ } 5d.$$

$$\cdot 761904 \text{ of } 1 \text{ g.} = \frac{16}{21} \times \frac{21}{1} = 16s.$$

$$\cdot 25 \text{ of } 10s. = \frac{25}{100} \text{ of } \frac{10}{1} = 2s. \text{ } 6d.; \quad \cdot 625 \text{ of } 1 \text{ cr.} = \frac{625}{1000} \text{ of } \frac{5}{1} = 3s. \text{ } 1\frac{1}{2}d.$$

$$\cdot 125 \text{ of } £10 \text{ } 5s. = \frac{125}{1000} \text{ of } \frac{205}{1} = £1 \text{ } 5s. \text{ } 7\frac{1}{2}d.$$

$$\therefore \text{sum} = 5s. \text{ } 5d. + 16s. + 3s. \text{ } 1\frac{1}{2}d. + 2s. \text{ } 6d. - £1 \text{ } 5s. \text{ } 7\frac{1}{2}d. = 1s. \text{ } 5d.$$

$$(12) 3\frac{1}{4} + \frac{4}{5} + \frac{1}{15} + 3\frac{1}{8} + 2\frac{1}{3} = 8\frac{30+96+8+15+40}{120} = 8\frac{189}{120} = 9\frac{23}{40}.$$

$$3\frac{1}{4} = 3\cdot25$$

$$\frac{4}{5} = \cdot 8$$

$$\frac{1}{15} = \cdot 0666$$

$$3\frac{1}{8} = 3\cdot125$$

$$2\frac{1}{3} = 2\cdot3333$$

$$9\cdot5749 = 9\cdot575 = 9\frac{23}{40}.$$

$$(13) \cdot 725 \text{ of } 10s. = 7\cdot25s. = 7s. \text{ } 3d.; \quad \cdot 03 \text{ of } £1 = \frac{3}{50} \text{ of } \frac{240}{1} = 8d.$$

$$\therefore \text{difference} = 7s. \text{ } 3d. - 8d. = 6s. \text{ } 7d.$$

$$2\cdot0693 \text{ of } 8s. \text{ } 5d. = 2\frac{893}{9999} \text{ of } \frac{101}{1} = 17s. \text{ } 5d.;$$

$$\cdot 7416 \text{ of } £1 = \frac{6875}{9999} \text{ of } \frac{240}{1} = 178d. = 14s. \text{ } 10d.$$

$$\text{Difference} = 17s. \text{ } 5d. - 14s. \text{ } 10d. = 2s. \text{ } 7d.$$

$$4) \frac{3 \cdot 625 \times \cdot 83}{\cdot 25} s. = 83s. \times 14 \cdot 5 = 12s. 1d.$$

$$5) \cdot 2472 \text{ of } 1A. = \frac{2448}{8800} \text{ of } \frac{180}{1} = \frac{2176}{88} \text{ pls.} = 39 \text{ pls. } 17 \text{ yds. } 64 \cdot 8 \text{ in.}$$

$$39P. 17 \text{ yds. } 64 \cdot 8 \text{ in., or } 39 \cdot 563 \text{ to the dec. of } 3 R. 10P., \text{ or } 130P.$$

$$130) 39 \cdot 563$$

$$\cdot 30433566.$$

$$3) \text{ i. } \begin{array}{r} \cdot 2564 \\ \cdot 0012 \\ \hline \cdot 00030768 \end{array}$$

$$\text{ii. } \cdot 00048) \cdot 00030768 \text{ (} \cdot 641$$

$$\begin{array}{r} 288 \\ \hline \end{array}$$

$$196$$

$$192$$

$$48$$

$$48$$

$$\dots$$

$$7) \cdot 07348 \text{ of } 1R. 15P. = \frac{7275}{88000} \text{ of } \frac{65}{1} = \frac{27}{24} \text{ pls.};$$

$$\cdot 0045 \text{ of } 1A. = \frac{45}{8800} \times \frac{180}{1} = \frac{8}{11} \text{ pls.}$$

$$\therefore \frac{27}{24} - \frac{8}{11} = \frac{875}{264} \text{ pls.} = 3 \text{ pls. } 9 \text{ yds. } 4 \text{ ft. } 85\frac{1}{2} \text{ in.}$$

$$\cdot 072 \text{ of } 1 \text{ mile} = \frac{72}{880} \times \frac{8 \times 40}{1} = \frac{256}{11} \text{ pls.} = 23 \text{ pls. } 1 \text{ yd. } 1 \text{ ft. } 6 \text{ in.};$$

$$\cdot 0185 \text{ of } 3 \text{ fur.} = \frac{185}{8800} \times \frac{3 \times 40}{1} = \frac{20}{9} \text{ pls.} = 2 \text{ pls. } 1 \text{ yd. } 8 \text{ in.}$$

$$\therefore 23 \text{ pls. } 1 \text{ yd. } 1 \text{ ft. } 6 \text{ in.} - 2 \text{ pls. } 1 \text{ yd. } 8 \text{ in.} = 21 \text{ pls. } 10 \text{ in.}$$

$$8) \frac{3125}{10000} \times \frac{2}{1} = \frac{625}{2000} = 12s. 6d.; \quad \frac{15}{800} \times \frac{2}{1} = \frac{3}{160} = 6d.;$$

$$\frac{714285}{880000} \text{ of } \frac{2 \times 21}{1} s. = \frac{5}{7} \times \frac{42}{1} s. = 30s., \text{ or } \text{£}1 10s.;$$

$$\frac{6375}{8000} \text{ of } \frac{5}{1} s. = \frac{85}{24} s. = 3s. 6\frac{1}{2}d.$$

$$\therefore (12s. 6d. + \text{£}1 10s.) - (6d. + 3s. 6\frac{1}{2}d.) = \text{£}1 18s. 5\frac{1}{2}d.$$

$$9) 3\frac{1}{7} + \frac{3}{14} + 1\frac{11}{22} + 6\frac{1}{3} + \frac{1}{21} = 10 \frac{6+9+11+14+2}{42} = 10\frac{42}{42} = 11.$$

$$3\frac{1}{7} = 3 \cdot 142857142$$

$$\frac{3}{14} = \cdot 214285714$$

$$1\frac{11}{22} = 1 \cdot 261904761$$

$$6\frac{1}{3} = 6 \cdot 333333333$$

$$\frac{1}{21} = \cdot 047619047$$

$$10 \cdot 999999997 = 11.$$

$$(20) \text{ Number of yds.} = (42 \cdot 7 \times 19 \cdot 00595238) + 1 \cdot 016 = \frac{427}{10} \times \frac{950297534}{4999999} \\ \times \frac{60}{81} = \frac{13304165336}{16888885} = 798 \cdot 2499, \text{ \&c., or } 798\frac{1}{4} \text{ yds. nearly.}$$

$$(21) \text{ i. } \frac{5}{4} \times \frac{15}{90} \times \frac{7}{1} l. = \frac{5}{12} l. = 8s. 4d.; \\ \text{ii. } 27\frac{1}{2} \times \frac{42691}{9900} \times \frac{1}{2} \times \frac{53}{2} \times \frac{42221}{9900} \times \frac{1}{2} = \frac{53}{2} \times \frac{296037}{720} = \pounds 411 \text{ 3s. 3d.}$$

$$(22) \frac{7 \cdot 142857 \times 1 \cdot 081}{1 \cdot 54} l. = \frac{7\frac{1}{7} \times 1\frac{8}{11} l.}{1\frac{5}{11}} = \frac{50}{7} \times \frac{119}{116} \times \frac{11}{17} = \pounds 5.$$

$(23) \cdot 0106 \text{ of } \pounds 1 \text{ 11s. 3d., or } 375d.$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r} 375 \\ 533 \\ 7466 \\ 31999 \\ \hline 3 \cdot 9998 = 4d. \end{array}$ </div>	$\cdot 0025974 \text{ of } \pounds 4 \text{ 16s. 3d., or } 1155d.$ <div style="text-align: right;"> $\begin{array}{r} 1155 \\ 129870 \\ 1298701 \\ 2597402 \\ \hline 25974025 \\ 2 \cdot 9999998 = 3d. \end{array}$ </div>
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$$\text{Difference} = 4d. - 3d. = 1d.$$

$$12) 1 \cdot 000$$

$$20) \cdot 083$$

$$\cdot 00416$$

$$(24) \cdot 1174 \times \cdot 0025 = \cdot 0002935; 2 \cdot 304 + \cdot 096 = 24.$$

$$12) 4 \cdot 5$$

$$20) 10 \cdot 375$$

$$5) 3 \cdot 51875$$

$$\cdot 70375$$

$$(25) \text{ i. } 3s. 1\frac{1}{2}d. \text{ or } 37 \cdot 5d. \times 7 \cdot 124 = 267 \cdot 15d., \text{ or } \pounds 1 \text{ 2s. } 3\frac{3}{8}d.;$$

$$\text{ii. } \pounds 414 \text{ 15s. } 0\frac{1}{4}d., \text{ or } 99540 \cdot 25d. + 6 \cdot 31 = 15775d., \text{ or } \pounds 65 \text{ 14s. } 7d.$$

$$(26) \frac{33\frac{1}{4}}{14\frac{1}{4}} \text{ of } \pounds 1\frac{1}{4} = \frac{133}{4} \times \frac{4}{57} \times \frac{5}{4} = \frac{35}{19} l. = \pounds 2 \text{ 18s. } 4d.$$

$$\cdot 87916 \text{ of } \pounds 1 \quad \cdot 40873015 \text{ of } 1 \text{ g.} \quad \cdot 678321 \text{ of } 11s. 11d., \text{ or } 143d.$$

$\begin{array}{r} 20 \\ 17 \cdot 58333s. \\ 12 \\ \hline 6 \cdot 999d. = 7d. \\ 17s. 7d. \end{array}$	$\begin{array}{r} 21 \\ 40873015 \\ 817460317 \\ \hline 8 \cdot 58333332s. \\ 12 \\ \hline 6 \cdot 999d. = 7d. \\ 8s. 7d. \end{array}$	$\begin{array}{r} 143 \\ 2034964 \\ 27132866 \\ \hline 67832167 \\ 96 \cdot 999997 = 97d. \\ \text{or } 8s. 1d. \end{array}$
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$$\therefore (\pounds 2 \text{ 18s. } 4d. + 8s. 7d.) - (17s. 7d. + 8s. 1d.) = \pounds 2 \text{ 1s. } 3d.$$

(33) i. $\cdot 81025 \times \cdot 9765625 \times \text{£}8 \text{ } 10\text{s. } 8\text{d.} = 1620\cdot 5\text{d.}$, or $\text{£}6 \text{ } 15\text{s. } 0\frac{1}{4}\text{d.}$

ii. $\cdot 074894514767932$ of 79 yds.

$$\begin{array}{r}
 79 \\
 \hline
 674050632911391 \\
 5242616033755273 \\
 \hline
 5\cdot 91666666666664 \text{ yds.} \\
 4 \\
 \hline
 3\cdot 666 \text{ qrs.} \\
 4 \\
 \hline
 2\cdot 6 \text{ nls.} \\
 2\cdot 25 \\
 \hline
 33 \\
 133 \\
 \hline
 1333 \\
 1\cdot 499 \text{ in.} = 1\cdot 5 \text{ or } 1\frac{1}{2} \text{ in.} \\
 5 \text{ yds. } 3 \text{ qrs. } 2 \text{ nls. } 1\frac{1}{2} \text{ in.}
 \end{array}$$

(34) $42 \div 101 = \cdot 4158$; $35 \div 72 = \cdot 4861$.

$$\begin{array}{r}
 1\cdot 527 = 1\frac{475}{300} = 1\frac{119}{36} ; \cdot 4769230 = \frac{4769230}{10000000} = \frac{217}{435} = \frac{31}{63} \\
 2,0) 7\cdot 25 \\
 \hline
 5) 2\cdot 3625 \\
 \hline
 \cdot 4725
 \end{array}$$

(35) $\cdot 35769230$ of $\text{£}13$.

$\cdot 615384$ of 13s.

$$\begin{array}{r}
 13 \\
 \hline
 107309692 \\
 357692307 \\
 \hline
 \text{£}4\cdot 64999999
 \end{array}$$

$$\begin{array}{r}
 13 \\
 \hline
 1846153 \\
 6153846 \\
 \hline
 7\cdot 999999\text{s.} = 8\text{s.}
 \end{array}$$

$$\begin{array}{r}
 20 \\
 \hline
 12\cdot 999\text{s.} = 13\text{s.} \\
 \text{£}4 \text{ } 13\text{s.}
 \end{array}$$

$$8\text{s.}$$

$\cdot 6904761$ of 3s. 6d., or 42d.

$\cdot 769230$ of $\text{£}2 \text{ } 12\text{s.}$, or 52s.

$$\begin{array}{r}
 42 \\
 \hline
 13809523 \\
 276190476 \\
 \hline
 28\cdot 9999999\text{d.} = 29\text{d.}
 \end{array}$$

$$\begin{array}{r}
 52 \\
 \hline
 1538461 \\
 38461538 \\
 \hline
 39\cdot 999999\text{s.} = 40\text{s.}
 \end{array}$$

$$2\text{s. } 5\text{d.}$$

$$\text{£}2\cdot$$

\therefore sum = ($\text{£}4 \text{ } 13\text{s.} + 8\text{s.} + 2\text{s. } 5\text{d.}$) - $\text{£}2$, or $\text{£}3 \text{ } 3\text{s. } 5\text{d.}$

6) i.
$$\begin{array}{r} 2\cdot545454 \\ \cdot75 \\ \cdot125 \\ \cdot333333 \\ \hline 3\cdot003787 \end{array}$$

ii.
$$\begin{array}{r} 4\cdot72187218 \\ 3\cdot54545454 \\ \hline 1\cdot17641764 \end{array}$$

iii.
$$\begin{array}{r} \cdot846153 \\ 117 \\ \hline 5923076 \\ 8461538 \\ 84615384 \\ \hline 98\cdot999999 = 99 \end{array}$$

iv. $\cdot4954 + 9\cdot90 = \frac{199}{220} \times \frac{11}{10} = \frac{1}{20}$, or $\cdot05$;
v. $99 \times \cdot05 \times 1\cdot1764 = 5\cdot823267$.

37) i. $\cdot45370$ of 3 fur. 18 pls., or 138 pls.
$$\begin{array}{r} 138 \\ 362962 \\ 1361111 \\ 4537037 \\ \hline 62\cdot61110 \text{ pls.} \\ 5\cdot5 \\ 3055 \\ 30555 \\ \hline 3\cdot361 \text{ yds.} \\ 3 \\ \hline 1\cdot083 \text{ ft.} \\ 12 \\ \hline \cdot999 \text{ in.} = 1 \text{ in.} \end{array}$$

ii. $\cdot1128472$ of an acre
$$\begin{array}{r} 4 \\ \hline \cdot4513888 \text{ rds.} \\ 40 \end{array}$$

$18\cdot05555 = 18\frac{1}{18}$ pls.

18 pls. 1 yd. 6 ft. 18 in.

1 fur. 22 pls. 3 yds. 1 ft. 1 in.

(38) $\frac{4\cdot32}{1\cdot\frac{2}{11} \text{ of } 1\frac{2}{3}} = \frac{1\cdot69}{360} \times \frac{11}{13} \times \frac{9}{11} = \frac{113}{40} = 2\frac{23}{40}$.

$\frac{17}{27} \text{ of } \frac{77}{36} \text{ of } \frac{22}{5} \text{ of } \frac{7}{15} = \frac{17}{27} \times \frac{77}{36} \times \frac{3}{22} \times \frac{12}{5} \times \frac{3}{17} \times \frac{15}{7} = \frac{1}{5}$.

$\therefore 2\frac{23}{40} - \frac{1}{5} = 2\frac{90-20}{120} = 2\frac{70}{120} = 2\cdot658\bar{3}$.

$$\begin{array}{r}
 \text{ft. in.} \\
 4) \quad 6 \quad 9 \\
 \quad \quad 5 \quad 5 \\
 \hline
 \quad 33 \quad 9 \\
 \quad \quad 2 \quad 9 \quad 9' \\
 \hline
 \quad 36 \quad 6 \quad 9
 \end{array}$$

$$\begin{array}{r}
 \text{ft. in.} \\
 (5) \quad 8 \quad 7 \\
 \quad \quad 9 \quad 6 \\
 \hline
 \quad 77 \quad 3 \\
 \quad \quad 4 \quad 3 \quad 6' \\
 \hline
 \quad 81 \quad 6 \quad 6
 \end{array}$$

$$\begin{array}{r}
 \text{ft. in.} \\
 (6) \quad 12 \quad 7 \\
 \quad \quad 11 \quad 9 \\
 \hline
 \quad 138 \quad 5 \\
 \quad \quad 9 \quad 5 \quad 3' \\
 \hline
 \quad 147 \quad 10 \quad 3
 \end{array}$$

$$\begin{array}{r}
 \text{ft. in.} \\
 7) \quad 7 \quad 3 \\
 \quad \quad 8 \quad 9 \\
 \hline
 \quad 58 \quad 0 \\
 \quad \quad 5 \quad 5 \quad 3' \\
 \hline
 \quad 63 \quad 5 \quad 3
 \end{array}$$

$$\begin{array}{r}
 \text{ft. in.} \\
 (8) \quad 5 \quad 11 \\
 \quad \quad 8 \quad 11 \\
 \hline
 \quad 47 \quad 4 \\
 \quad \quad 5 \quad 5 \quad 1' \\
 \hline
 \quad 52 \quad 9 \quad 1
 \end{array}$$

$$\begin{array}{r}
 \text{ft. in.} \\
 (9) \quad 13 \quad 8 \quad 6' \\
 \quad \quad 7 \quad 11 \quad 3 \\
 \hline
 \quad 95 \quad 11 \quad 6 \\
 \quad \quad 12 \quad 6 \quad 9 \quad 6'' \\
 \hline
 \quad \quad \quad 3 \quad 5 \quad 1 \quad 6''' \\
 \hline
 \quad 108 \quad 9 \quad 8 \quad 7 \quad 6
 \end{array}$$

$$\begin{aligned}
 1) \text{ No. of yds.} &= \{(22\frac{1}{2} \text{ ft.} \times 15\frac{1}{2} \text{ ft.}) \div \frac{27}{12} \text{ ft.}\} \div 3 = \frac{45}{2} \times \frac{63}{4} \times \frac{12}{27} \times \frac{1}{3} \\
 &= \frac{395}{2} \text{ yds.} = 52\frac{1}{2} \text{ yards.} \\
 \text{Expense} &= \frac{195}{2} \text{ yds.} \times \frac{1}{4} s. = \frac{1785}{8} s. = \pounds 11 \text{ } 3s. \text{ } 1\frac{1}{2} d.
 \end{aligned}$$

$$\begin{aligned}
 1) \text{ Area of walls} &= \{(\text{length} \times \text{breadth}) \times 2 \times \text{height}\}. \\
 \therefore \text{cost} &= \{(18\frac{1}{4} \text{ ft.} + 20 \text{ ft.}) \times 2 \times 9\frac{1}{2} \text{ ft.} \times 9\frac{1}{2} d.\} + 9 = \frac{153}{4} \times \frac{2}{1} \times \frac{19}{2} \\
 &\times \frac{19}{2} \times \frac{1}{8} = \frac{6137}{8} d. = \pounds 3 \text{ } 3s. \text{ } 11\frac{1}{8} d.
 \end{aligned}$$

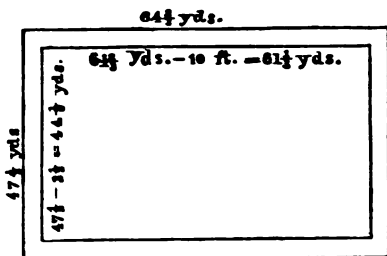
$$\begin{aligned}
 2) \text{ Cost of paving} &= (78\frac{1}{2} \text{ ft.} \times 41\frac{1}{3} \text{ ft.} \times 33\frac{1}{2} d.) + 9 = \frac{315}{4} \times \frac{124}{3} \times \frac{67}{2} \times \frac{1}{8} \\
 &= \frac{72695}{8} d. = \pounds 50 \text{ } 9s. \text{ } 7\frac{5}{8} d. \\
 \text{No. of stones} &= (78\frac{1}{2} \times 41\frac{1}{3}) \div (2\frac{1}{4} \text{ ft.} \times 1\frac{2}{3} \text{ ft.}) = \frac{315}{4} \times \frac{124}{3} \times \frac{4}{9} \times \frac{3}{8} = 868.
 \end{aligned}$$

$$\begin{aligned}
 3) \text{ No. of gals.} &= 51 \text{ in.} \times 42 \text{ in.} \times 32 \text{ in.} \div 277\frac{1}{4} \text{ in.} = \frac{51 \times 42 \times 32 \times 4}{1109} \text{ gals.} \\
 &= \frac{274176}{1109} \text{ gals.} = 247\frac{253}{1109} \text{ gallons.} \\
 \text{Weight of water} &= 4\frac{1}{4} \text{ ft.} \times 3\frac{1}{2} \text{ ft.} \times 2\frac{2}{3} \text{ ft.} \times 62\frac{1}{2} \text{ lbs.} = \frac{17}{4} \times \frac{7}{2} \times \frac{8}{3} \times \frac{125}{2} \\
 &= \frac{14875}{8} \text{ lbs.} = 1 \text{ ton } 2 \text{ cwt. } 15 \text{ lbs. } 2\frac{3}{8} \text{ oz.}
 \end{aligned}$$

$$\begin{aligned}
 4) \text{ No. of lbs. of lead on sides of cistern} &= 2(4\frac{1}{4} \text{ ft.} + 3\frac{1}{2} \text{ ft.}) \times 2\frac{2}{3} \text{ ft.} \\
 &\times 8 \text{ lbs.} = \frac{31}{2} \times \frac{8}{3} \times \frac{8}{1} = \frac{992}{3} \text{ lbs.} \\
 \text{No. of lbs. of lead on bottom of cistern} &= 4\frac{1}{4} \text{ ft.} \times 3\frac{1}{2} \text{ ft.} \times 8 \text{ lbs.} \\
 &= \frac{17}{4} \times \frac{7}{2} \times \frac{8}{1} = 119 \text{ lbs.} \\
 \therefore \text{No. of lbs. of lead used} &= \frac{992}{3} + 119 = \frac{1349}{3} \text{ lbs.} \\
 \text{Cost of lining} &= \frac{1349}{3} \times 38\frac{1}{2} s. \div 112 \text{ lbs.} = \frac{1349}{3} \times \frac{77}{2} \times \frac{1}{112} = \frac{14839}{96} s. \\
 &= \pounds 7 \text{ } 14s. \text{ } 6\frac{7}{8} d.
 \end{aligned}$$

$$5) \text{ Cost of cloth} = 24 \text{ yds.} \times 1\frac{1}{2} \text{ yds.} \times 3\frac{1}{4} s. = \frac{24}{1} \times \frac{3}{2} \times \frac{13}{4} = 117 s. = \pounds 5 \text{ } 17s.$$

(16)



Dimensions of garden = $64\frac{2}{3}$ yds. \times $47\frac{1}{2}$ yds. = $\frac{184}{3} \times \frac{95}{2} = 3071$ sq. yds. 6 ft.

Dimensions of digging-ground = $61\frac{1}{3}$ yds. \times $44\frac{1}{2}$ yds. = $\frac{184}{3} \times \frac{89}{2} = 2708$ sq. yds. 9 ft.

\therefore dimensions of path = 3071 sq. yds. 6 ft. — 2708 sq. yds. 8 ft. = 362 sq. yds. 7 ft.

Expense of gravelling = $\{2(64\frac{2}{3}$ yds. + $44\frac{1}{2}$ yds.) \times $49d.$ $\} + 10$
 $= \frac{653+2}{6} \times \frac{1}{1} \times \frac{1}{10} = \frac{31097}{30}d. = \text{£}4 \text{ 8s. } 10\frac{17}{30}d.$

(17) Cost of digging = $(61\frac{1}{3}$ yds. \times $44\frac{1}{2}$ yds. \times $4\frac{1}{2}d.$) + $30\frac{1}{2}$ yds. = $\frac{184}{3} \times \frac{89}{2} \times \frac{9}{2} + \frac{184}{3} \times \frac{1}{2} = \frac{487602}{131}d. = \text{£}1 \text{ 13s. } 6\frac{118}{131}d.$

(18) No. of sq. ft. = $384 + 4 = 96$.

As the box has six sides $\therefore 96 \div 6 = 16$ sq. ft., area of one side;

\therefore edge of the box = $\sqrt{16} = 4$ ft.

(19) Quantity of timber to be cut off = $7\frac{1}{2}$ c. ft. + $(11\frac{1}{4} \times 4\frac{1}{2} \times \frac{1}{144})$ sq. ft.
 $= \frac{15}{2} \times \frac{4}{45} \times \frac{2}{9} \times \frac{144}{1} = \frac{64}{3}$ ft. = $21\frac{1}{3}$ ft.

(20) Expense = (diam.)² \times $\frac{1}{14} \times 20 \times 4\frac{1}{2} = \frac{7}{2} \times \frac{7}{2} \times \frac{11}{14} \times \frac{20}{1} \times \frac{19}{2} = \frac{7315}{8}s.$
 $= \text{£}45 \text{ 14s. } 4\frac{1}{2}d.$

(21) Quantity of timber required for sides = $2(5\frac{1}{2}$ ft. + $3\frac{1}{4}$ ft.) \times $2\frac{3}{4}$ ft.
 $= \frac{95}{2} \times \frac{11}{4} = \frac{2055}{8}$ ft., or $48\frac{3}{8}$ ft.

Timber required for lid and bottom = $5\frac{1}{2}$ ft. \times $3\frac{1}{4}$ ft. \times $2 = \frac{11}{2} \times \frac{13}{4} \times \frac{2}{1} = \frac{143}{2}$ ft., or $35\frac{3}{4}$ ft.

\therefore quantity of timber required 9 in. broad and 1 in. thick
 $= (48\frac{3}{8}$ ft. + $35\frac{3}{4}$ ft.) + 9 in., or $\frac{7}{2}$ ft. = $\frac{271}{2} \times \frac{2}{3} = \frac{271}{3}$ ft., or $111\frac{2}{3}$ ft.

(22) Cost = $9\frac{3}{4}$ ft. \times $2\frac{3}{4}$ ft. \times $1\frac{1}{2}$ ft. \times $2\frac{1}{2}s. = \frac{39}{4} \times \frac{11}{4} \times \frac{4}{3} \times \frac{5}{2} = \frac{715}{8}s.$
 $= \text{£}4 \text{ 9s. } 4\frac{1}{2}d.$

(23) 100000 links = 1 acre.

$$4375 \text{ links} \times 275 \text{ links} = 1203125 \text{ links} = 12.03125 \text{ acres} = 12\text{A. } 5\text{P.}$$

$$(24) \text{ Cost} = 98\frac{1}{2} \text{ ft.} \times 24\frac{1}{2} \text{ ft.} \times \frac{45}{240} = \frac{395}{8} \times \frac{49}{8} \times \frac{45}{240} = \frac{14455}{32} \\ = \text{£}451 \text{ 14s. } 4\frac{1}{2}\text{d.}$$

$$(25) \text{ Cost} = (81 \text{ ft.} \times 7\frac{1}{2} \text{ ft.} \times 7\frac{1}{2} \text{ ft.} \times 8\text{d.}) + 27 = \frac{91}{1} \times \frac{43}{8} \times \frac{15}{2} \times \frac{9}{1} \times \frac{1}{27} \\ = 1290\text{d.} = \text{£}5 \text{ 7s. } 6\text{d.}$$

(26) No. of sq. ft. = $441 + 6 = 73\frac{1}{2}$.

As the box has six sides $\therefore 73\frac{1}{2} + 6 = 12\frac{1}{2}$ sq. ft., area of one side.

$$\therefore \text{edge} = \sqrt{12\frac{1}{2}} = \sqrt{\frac{25}{2}} = \frac{5}{\sqrt{2}} \text{ or } 3\frac{1}{2} \text{ ft.}$$

(27) Sides cost $2(10\frac{1}{8} \text{ ft.} + 5\frac{1}{2} \text{ ft.}) \times 2\frac{1}{4} \text{ ft.} = \frac{94}{8} \times \frac{5}{4} = \frac{141}{8}$ or $70\frac{1}{2}$ ft.

Top and bottom cost $(10\frac{1}{8} \text{ ft.} \times 5\frac{1}{2} \text{ ft.}) \times 2 = \frac{91}{8} \times \frac{11}{2} \times \frac{2}{1} = \frac{671}{8}$ or $111\frac{5}{8}$ ft.

$$\therefore \text{cost of hewing all faces of the stone} = (70\frac{1}{2} \text{ ft.} + 111\frac{5}{8} \text{ ft.}) \times \frac{\text{£}1}{40} \\ = \frac{547}{8} \times \frac{1}{40} = \frac{\text{£}547}{320}, \text{ or } \text{£}4 \text{ 11s. } 2\text{d.}$$

(28) No. of bullocks = $(69\frac{1}{2} \text{ ft.} \times 15\frac{3}{4} \text{ ft.}) + 21 \text{ ft.} = \frac{295}{2} \times \frac{63}{4} \times \frac{1}{21} = 52$.

$$(29) \text{ Cost} = \{(\text{diam.})^2 \times \frac{1}{12} \times 40 \text{ ft.} \times 6\frac{3}{4}\text{s.}\} + 27 = \frac{10}{3} \times \frac{10}{3} \times \frac{11}{4} \times \frac{40}{1} \times \frac{27}{4} \times \frac{1}{27} \\ = \frac{5500}{3}\text{s.} = \text{£}4 \text{ 7s. } 3\frac{1}{2}\text{d.}$$

(30) Area of circle = $(\text{radius})^2 \times \frac{\pi}{2}$ or $(\text{diam.})^2 \times \frac{1}{14}$.

$$\text{Area of large pipe} = 18 \text{ ft.} - \frac{3}{4} \text{ ft., or } (17\frac{1}{4})^2 \times \frac{\pi}{2} = \frac{69}{4} \times \frac{69}{4} \times \frac{\pi}{2} \\ = \frac{62371}{8} \text{ sq. in.} = 935\frac{11}{8} \text{ sq. in.}$$

$$\text{Area of 2 small pipes} = 9 \text{ ft.} - \frac{1}{2} \text{ ft., or } (8\frac{1}{2})^2 \times \frac{\pi}{2} \times \frac{2}{1} = \frac{17}{2} \times \frac{17}{2} \times \frac{\pi}{2} \\ \times \frac{2}{1} = \frac{3179}{4} \text{ sq. in.} = 454\frac{1}{4} \text{ sq. in.}$$

$$\therefore \text{difference in area of pipes} = 935\frac{11}{8} - 454\frac{1}{4} = 481\frac{3}{8} \text{ sq. in.}$$

Let $AC = R$, and $BC = r$;

$$\therefore (R^2 \times \frac{\pi}{2}) - (r^2 \times \frac{\pi}{2}) = \text{area of ring.}$$

$$(R^2 - r^2) \frac{\pi}{2} \text{ or } (R + r)(R - r) \frac{\pi}{2} = \text{area of ring;}$$

\therefore metal in 100 ft. of large pipes

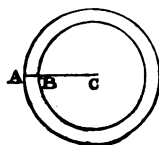
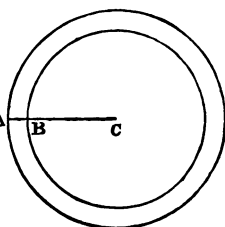
$$= \{(18 + 17\frac{1}{4})(18 - 17\frac{1}{4}) \frac{\pi}{2} + 144\} \\ \times 100 = \frac{141}{4} \times \frac{3}{4} \times \frac{\pi}{2} \times \frac{100}{1} \times \frac{1}{144} = \\ \frac{12925}{324} \text{ ft.} = 57 \text{ ft. } 1211\frac{1}{2} \text{ in.}$$

Metal in 200 ft. of small pipes = $\{(9 + 8\frac{1}{2})$

$$(9 - 8\frac{1}{2}) \frac{\pi}{2} + 144\} \times 200 = \frac{35}{2} \times \frac{1}{2} \times \frac{\pi}{2} \times \frac{200}{1} \\ \times \frac{1}{144} = \frac{1375}{36} \text{ sq. ft.} = 38 \text{ sq. ft. } 336 \text{ sq. in.}$$

Difference in metal = 57 sq. ft. 1211 $\frac{1}{2}$ sq. in.

$$- 38 \text{ sq. ft. } 336 \text{ sq. in.} = 19 \text{ sq. ft. } 875\frac{1}{2} \text{ sq. in.}$$



$$(31) \text{ Cost} = \{ 2(127 \text{ yds.} + 74 \text{ yds. } 2 \text{ ft.}) \times 9 \text{ ft.} \times £9 \} \div 272\frac{1}{2} = \frac{605 \times 2}{1} \\ \times \frac{2}{1} \times \frac{2}{1} \times \frac{4}{1000} = £360.$$

$$\text{No. of bricks} = 2(127 \text{ yds.} + 74 \text{ yds. } 2 \text{ ft.}) \times 9 \text{ ft.} \times 13\frac{1}{2} \text{ in.} \div (9 \text{ in.} \\ \times 4\frac{1}{2} \text{ in.} \times 2\frac{1}{4} \text{ in.}) = \frac{605 \times 2 \times 36}{3} \times \frac{9 \times 12}{1} \times \frac{27}{2} \times \frac{1}{5} \times \frac{2}{5} \times \frac{4}{5} = 232320 \\ \text{bricks.}$$

$$(32) \text{ Length of each beam} = 9000 \text{ c. ft.} + (\frac{8}{12} \text{ ft.} \times \frac{15}{12} \text{ ft.} \times 300 \text{ ft.}) = \frac{9000}{1} \\ \times \frac{12}{8} \times \frac{12}{12} \times \frac{1}{360} = 36 \text{ ft.}$$

$$(33) \text{ Solid contents of square rod} = (1)^2 \times 18 = 18 \text{ c. in.}$$

$$\text{„ „ round rod} = (1)^2 \times \frac{11}{4} \times 18 = \frac{99}{2} \text{ c. in.}$$

$$\therefore \text{ weight of round iron rod} = (\frac{99}{2} \times 5\frac{1}{4} \text{ lbs.}) + 18 = \frac{99 \times 21}{18 \times 7 \times 4} = \frac{231}{4} \text{ lbs.} \\ = 4\frac{1}{4} \text{ lbs.}$$

$$(34) \text{ Hypotenuse} = \sqrt{(24\cdot5)^2 + (40)^2} = \sqrt{2200\cdot25} = 46\cdot906, \&c.$$

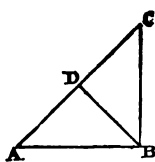
$$(35) \text{ Base} = \sqrt{(35)^2 - (21)^2} = \sqrt{784} = 28.$$

$$(36) \text{ Diagonal} = \sqrt{(6)^2 + (6)^2} = \sqrt{72} = 8\cdot485, \&c.$$

$$(37) \text{ Diagonal} = \sqrt{(7\cdot5)^2 + (3)^2} = \sqrt{65\cdot25} = 8\cdot077, \&c.$$

$$(38) \text{ Breadth of river} = \sqrt{(80)^2 - (45)^2} = \sqrt{4375} = 66\cdot14 \text{ yds.}$$

$$(39) \text{ Breadth of street} = \begin{cases} \sqrt{(45)^2 - (36)^2} = \sqrt{729} = 27 \text{ ft.} \\ \sqrt{(45)^2 - (27)^2} = \sqrt{1296} = 36 \text{ ft.} \end{cases} \\ \therefore 27 \text{ ft.} + 36 \text{ ft.} = 63 \text{ ft.}$$



$$(40)* \text{ Hypotenuse} = \sqrt{(56)^2 + (42)^2} = \sqrt{4900} = 70.$$

$$\therefore 35BD = 56 \times 21 \therefore BD = \frac{56 \times 21}{35} = \frac{168}{5} = 33\frac{3}{5}.$$

$$(41) \text{ Let } x = \text{each side} \therefore 2x^2 = (9)^2 \text{ or } 81.$$

$$\therefore x^2 = 40\cdot5 \text{ sq. yds.}$$

$$(42) \text{ Perpendicular} = \sqrt{(90)^2 - (72)^2} = \sqrt{2916} = 54.$$

$$\therefore \text{ area of rectangle} = 54 \times 72 = 3888 \text{ sq. yds.}$$

$$(43)* \text{ Perpendicular let fall upon base} = \sqrt{(80)^2 - (48)^2} = \sqrt{4096} = 64.$$

$$\therefore \text{ area of isosceles triangle} = 64 \times 48 = 3072 \text{ sq. yds.}$$

$$(44)* \text{ Perpendicular let fall upon base} = \sqrt{(12)^2 - (6)^2} = \sqrt{108} = 10\cdot39.$$

$$\therefore \text{ area} = 10\cdot39 \times 6 = 62\cdot34.$$

* Area of triangle = perpendicular multiplied by half the base.

EXERCISE XLVI., p. 74.

- (1) 36 acres : 54 acres :: £48 : $\frac{54 \times 48}{36}l. = £72.$
- (2) £900 : £540 :: 10 months : $\frac{540 \times 10}{900}$ months = 6 months.
- (3) £984 : £246 :: 328 cwt. = $\frac{246 \times 328}{984}$ cwt. = 82 cwt.
- (4) 615 gals. : 984 gals. :: £545 : $\frac{984 \times 545}{615}l. = £872.$
- (5) 9 hrs. : 10 hrs. :: 18 wks. : $\frac{10 \times 18}{9}$ wks. = 20 wks.
- (6) £700 : £1 :: £17½ : $\frac{1 \times 17\frac{1}{2}}{700}l. = \frac{1 \times 35}{2 \times 700}l. = £\frac{1}{40},$ or 6 pence.
- (7) 80 lbs. : 20 lbs. :: £2 15s. 4d. : $\frac{20 \times 664}{80}d. = 166d.,$ or 13s. 10d.
- (8) 33 × 21s. : 189 × 20s. :: 11 wks. : $\frac{189 \times 20 \times 11}{33 \times 21}$ wks. = 60 weeks.
- (9) 81 lbs. : 27 lbs. :: £1 17s. 6½d. : $\frac{27 \times 1803}{81}f. = 601f.,$ or 12s. 6½d.
- (10) £4½ : £5½ :: 224 mls. : $\frac{41 \times 224 \times 3}{14 \times 8}$ mls. = 246 mls.
- (11) 3 lbs. 6 oz. : 17 cwt. :: 2s. 9½d. : $\frac{17 \times 112 \times 16 \text{ oz.} \times \frac{135}{4}d.}{54 \text{ oz.}}$
 $= \frac{17 \times 112 \times 16 \times 135}{54 \times 4}d. = 19040d.,$ or £79 6s. 8d.
- (12) 1 cwt. : 1 lb. :: 97 g. : $\frac{1 \text{ lb.} \times 97 \times 21}{112 \text{ lbs.}}s. = \frac{2037}{112}s. = 18s. 2¼d.$
- (13) £1 6½s. : £186 15s. :: 1 cwt. 2 qrs. 14 lbs. : $\frac{3735s. \times 182 \text{ lbs.}}{105s.}$
 $= \frac{3735 \times 182 \times 2}{105} \text{ lbs.} = 25896 \text{ lbs.,}$ or 11 tons. 11 cwt. 0 qrs. 24 lbs.
- (14) 1 hr. : 1 sec. :: 63 mls. : $\frac{1s. \times 63 \times 1760 \text{ yds.}}{60 \times 60s.} = \frac{154}{5} \text{ yds.,}$ or 30 yds.
 2 ft. 4½ in.
- (15) £1 : £1356 :: 4s. 7½d. : $\frac{£1356 \times \frac{111}{2}d.}{£1} = \frac{1356 \times 111}{2}d. = 75258d.,$
 or £313 11s. 6d.

- (16) 14 ft. : 5236 mls. :: 1 sec. : $\frac{5236 \times 1760 \times 3 \text{ ft.} \times 1}{14 \times 60}$ min.
= 32912 min., or 22 dys. 20 hrs. 32 min.
- (17) 4592 children : 3920 children :: £14782 1s. 4½d.
: $\frac{3920 \times 7071393}{4592}$ *hl. d.* = 6036555 *hl. d.*, or £12576 3s. 1½d.
- (18) 19 lbs. 11 oz. : 27 lbs. 9 oz. :: 5730 gals. : $\frac{441 \text{ oz.} \times 6730}{315 \text{ oz.}}$ gals.
= 8022 gals.
- (19) 7 tuns : 1 qt. :: £1256 17s. : $\frac{1 \text{ qt.} \times 25137}{7 \times 4 \times 252 \text{ qts.}}$ s. = $\frac{57}{18}$ s. = 3s. 6¾d.
- (20) 1 lb. : 12 cwt. 3 qrs. 24 lbs. :: 5s. 4½d. : $\frac{1452 \text{ lbs.} \times \frac{257}{4} \text{ d.}}{1 \text{ lb.}}$
= $\frac{1452 \times 257}{4}$ d. = 93291d., or £388 14s. 3d.
- (21) 13248 c. ft. : 225216 c. ft. :: £77 1s. 4d. : $\frac{225216 \times 18496}{13248}$ d.
= 314432d., or £1310 2s. 8d.
- (22) 205128 trees : 2549 doz. and 3 :: 116A. 2R. 8P.
: $\frac{30591 \text{ t.} \times 18648 \text{ pls.}}{205128 \text{ t.}}$ = 2781 pls., or 17A. 1R. 21P.
- (23) 121 bar. 29 gals. 2 qts. : 69 bar. 22 gals. :: £36 14s. 1½d.
: $\frac{2506 \text{ gals.} \times \frac{17619}{4} \text{ d.}}{\frac{17542}{4} \text{ gals.}} = \frac{2506 \times 17619 \times 4}{17542 \times 2}$ d. = 5034d., or £20 19s. 6d.
- (24) 1 bus. : 2 bus. 3 pks. × 10 :: 2s. 8d. : $\frac{\frac{11}{2} \times 10 \text{ bus.} \times 32 \text{ d.}}{1 \text{ bus.}}$
= $\frac{11 \times 10 \times 32}{4}$ d. = 880d. - 20d. = 860d., or £3 11s. 8d.
- (25) i. 1A. : 57A. 3R. 12P. :: 4 qrs. 5 bus. 2 pks. : $\frac{9252 \text{ pls.} \times 150 \text{ pks.}}{160 \text{ pks.}}$
= $\frac{34695}{4}$ pks. = 271 qrs. 0 bus. 1 pk. 1½ gal.
ii. 1 qr. : $\frac{34695}{4}$ pks. :: £26 8s. : $\frac{\frac{34695}{4} \text{ pks.} \times 320 \text{ s.}}{8 \times 4 \text{ pks.}}$
= $\frac{34695 \times 320}{8 \times 4 \times 4}$ d. = $\frac{173475}{2}$ d., or £361 8s. 1½d.
- (26) £320 5s. : £85 8s. :: 105 dys. : $\frac{1708 \text{ s.} \times 105 \text{ dys.}}{6405 \text{ s.}}$ = 28 days.
- (27) £13 10s. : £327 18s. :: 11A. 1R. : $\frac{6558 \text{ s.} \times 45 \text{ R.}}{270 \text{ s.}}$ = 1093R.
= 273A. 1R.

$$(28) \text{ 5 tons 17 cwt. : 3 tons :: 9s. 9d. : } \frac{3 \times 20 \text{ cwt.} \times 117d.}{117 \text{ cwt.}} = 60, \text{ or } 5s.$$

$$(29) 45\frac{1}{2} \text{ g. : 125 g. :: } £7 \text{ 19s. 3d. : } \frac{125 \text{ g.} \times 1911d.}{45\frac{1}{2} \text{ g.}} = \frac{125 \times 1911 \times 2}{91}d. \\ = 5250d., \text{ or } £21 \text{ 17s. 6d.}$$

$$(30) 65 \text{ qrs. 2 bush. 2 pks. : 18 qrs. 7 bush. 1 pk. :: 152 sacks} \\ : \frac{605 \text{ pks.} \times 152}{2090 \text{ pks.}} \text{ sacks} = 44 \text{ sacks.}$$

$$(31) 1 \text{ lb. 9 oz. : 1 oz. :: } £81 \text{ 14s. 6d. : } \frac{1 \text{ oz.} \times 19614}{21 \text{ oz.}}d. = 934d., \text{ or} \\ £3 \text{ 17s. 10d.}$$

$$(32) 81A. 3R. 15P. : 13A. 3R. 31P. :: £577 \text{ 2s. 6d. : } \frac{2231 \text{ pls.} \times 138510}{13095 \text{ pls.}}d. \\ = 23598d., \text{ or } £98 \text{ 6s. 6d.}$$

$$(33) 74 \text{ yds. 2 ft. : 10 yds. 4 in. :: 9 yds. 1 ft. : } \frac{364 \text{ in.} \times 28 \text{ ft.}}{224 \times 12 \text{ in.}} \\ = 2\frac{1}{4} \text{ ft.} = 1 \text{ yd. } 9\frac{1}{2} \text{ in.}$$

$$(34) 12 \text{ yds. 1 ft. 8 in. : 817 yds. 0 ft. 8 in. :: 3 ft. } 1\frac{3}{8} \text{ in.} \\ : \frac{29420 \text{ in.} \times 1\frac{3}{8} \text{ in.}}{452 \text{ in.}} = \frac{29420 \times 113}{452 \times 8} \text{ in.} = 735\frac{5}{8} \text{ in.} \\ = 68 \text{ yds. } 3\frac{3}{8} \text{ in.}$$

$$(35) 122 \text{ mls. 3 fur. 16 pls. 3 yds. 2 ft. : 5 yds. 10 pls. :: } £538679\frac{1}{3} \\ : \frac{1610 \times 5\frac{1}{2} \times 3 \text{ ft.} \times £3232075}{646415 \text{ ft.}} = \frac{1610 \times 11 \times 3 \times 3232075}{646415 \times 2 \times 6}l. \\ = £44375 = £22137 \text{ 10s.}$$

$$(36) 25 \text{ tons 18 cwt. 2 qrs. 5 lbs. : 32 cwt. 0 qrs. 1 lb. :: } £388 \text{ 16s.} \\ : \frac{3585 \text{ lbs.} \times £1944}{58077 \text{ lbs.}} = \frac{3585 \times 1944}{58077 \times 5}l. = £24.$$

$$(37) 15 \text{ cwt. 3 qrs. 9 lbs. 3 oz. : 4 tons :: } £33 \text{ 15s. 6d.} \\ : \frac{4 \times 112 \times 20 \times 16 \text{ oz.} \times 8106}{28371 \text{ oz.} \times 240}l. = £21\frac{2}{3} = £170 \text{ 13s. 4d.}$$

$$(38) 345 \text{ wks. : 207 wks. :: 15 oz. : } \frac{207 \times 15}{345} \text{ oz.} = 9 \text{ oz.}$$

$$(39) £100 : £9\frac{3}{4} :: £3285 : \frac{39 \times 3285}{100}l. = \frac{39 \times 3285}{4 \times 100}l. = £2562\frac{3}{20} \\ = £320 \text{ 5s. 9d. land tax.}$$

$$\therefore \text{ net income} = £3285 - £320 \text{ 5s. 9d.} = £2964 \text{ 14s. 3d.}$$

- (40) 126 mls. : 287 mls. :: £1 7s. 9d. : $\frac{287 \times 333}{126}d. = \frac{15117}{2}d.$, or
£3 3s. $2\frac{1}{2}d.$
- (41) £6426 : £1 :: £348 1s. 6d. : $\frac{1 \times 83538}{6426}d. = 13d.$, or 1s. 1d.
- (42) 5 cwt. 1 qr. 13 lbs. 9 oz. : 2 tons 13 cwt. 3 qrs. :: £9 3s. 4d.
: $\frac{215 \times 28 \times 16 \text{ oz.} \times 2200}{9625 \text{ oz.}}d. = 22016d.$, or £91 14s. 8d.
- (43) £93 19s. 6d. : 145½ gs. :: £4 9s. 6d. : $\frac{291 \times 21 \times 12 \times 1074}{22554}d.$
= $\frac{291 \times 21 \times 12 \times 1074}{22554 \times 2}d. = 1746d.$, or £7 5s. 6d.
- (44) £3020 : £1 :: £220 4s. 2d. : $\frac{1 \times 52850}{3020}d. = 17\frac{1}{2}d.$, or 1s. $5\frac{1}{2}d.$
- (45) 7 acres : 856A. 3R. 24P. :: £8½ : $\frac{137104 \text{ pls.} \times 35}{7 \times 4 \times 40 \text{ pls.} \times 4}l. = \frac{1248980}{8}l.$
£1071 2s. 6d.
- (46) £456 17s. 4d. : £357 7s. 3d. :: £41 10s. 8d. : $\frac{85767 \times 9968}{109648}d.$
= 7797d., or £32 9s. 9d.
- (47) 86 cwt. 1 qr. 9 lbs. : 7 cwt. 3 qrs. 11 lbs. :: £89 6s. 7d.
: $\frac{879 \text{ lbs.} \times 21439d.}{9669 \text{ lbs.}} = 1949d.$, or £8 2s. 5d.
- (48) £1 : £6426 15s. :: 7d. : $\frac{£6426\frac{1}{2} \times 7d.}{1} = \frac{25707 \times 7}{4}d. = \frac{179949}{4}d.$, or
£187 8s. $11\frac{1}{4}d.$
- (49) 3 yds. : 126 yds. 2 qrs. 2 nls. $\times 6$:: £1 3s. 3d. : $\frac{2026 \times 6 \text{ nls.} \times 279d.}{3 \times 4 \times 4 \text{ nls.}}$
= $\frac{282627}{4}d. = £294$ 8s. $0\frac{3}{4}d.$
- (50) £6862½ : £1 :: £228 14s. 9d. : $\frac{1 \times 54897 \times 8}{54897}d. = 8d.$
- (51) £66 : £44 :: £5½ : $\frac{44 \times 11}{66 \times 2}l. = £\frac{11}{3} = £3$ 13s. 4d.
- (52) 5 mls. 7 fur. 137 yds. : 23 mls. 1428 yds. :: $1\frac{1}{3}$ hrs.
: $\frac{41908 \text{ yds.} \times 4}{10477 \text{ yds.} \times 3} \text{ hrs.} = \frac{16}{3}$, or 5 hrs. 20 min.
- (53) £4725 : £87½ :: £31 10s. : $\frac{175 \times 630}{4725 \times 2}s. = \frac{35}{3}s.$, or 11s. 8d.

$$(54) \text{ £1 : £3265 17s. 9d. :: 11s. 8d. : } \frac{783813 \times 140}{20 \times 12} d. = \frac{1828897}{4} d., \text{ or } \text{£1905 2s. 0}\frac{1}{4}d.$$

$$(55) \text{ £50 : £70}\frac{5}{8} :: \text{£8 8s. : } \frac{425 \times 168}{50 \times 6} s. = 238s. = \text{£11 18s.}$$

$$(56) \text{ 2 tons 6 cwt. 3 qrs. 14 lbs. : 1 cwt. :: £4 13s. 9d. : } \frac{4 \text{ qrs.} \times 1125d.}{\frac{275}{3} \text{ qrs.}} \\ = \frac{4 \times 1125 \times 2}{375} d. = 24d., \text{ or 2s.}$$

$$(57) \text{ £3221 : £1 :: £540 3s. 9}\frac{1}{4}d. : \frac{\text{£1} \times 518581f.}{\text{£3221}} = 161f., \text{ or 3s. 4}\frac{1}{4}d.$$

$$(58) \text{ 1 oz. : 12 lbs. 7 oz. 11 dwts. 6 grs. :: £3 17s. 8d. : } \frac{\frac{12125}{4} \text{ dwts.} \times 932d.}{20 \text{ dwts.}} = \frac{12125 \times 932}{20 \times 4} d. = \frac{565025}{4} d. = \text{£588 11s. 4}\frac{1}{2}d.$$

$$(59) \text{ £100 : £10000 :: £3}\frac{5}{8} : \frac{10000 \times 29}{100 \times 8} l. = \text{£7}\frac{25}{8} = \text{£362 10s. taxes.} \\ \therefore \text{ net income} = \text{£10000} - \text{£362 10s.} = \text{£9637 10s.}$$

$$(60) \text{ £122 10s. 3d. : £99 :: £10 14s. 6d. : } \frac{\text{£99} \times 2574d.}{\frac{\text{£9901}}{80}} \\ = \frac{99 \times 2574 \times 80}{9801} d. = 2080d., \text{ or £8 13s. 4d.}$$

$$(61) \text{ 8 tons 5 cwt. 3 qrs. 21 lbs. : 4 tons 19 cwt. 2 qrs. 7 lbs.} \\ \therefore \text{ £2 8s. 10}\frac{1}{4}d. : \frac{\frac{1593}{4} \text{ qrs.} \times \frac{2345}{4} d.}{\frac{2655}{4} \text{ qrs.}} = \frac{1593 \times 2345 \times 4}{2655 \times 4 \times 4} d. = \frac{1407}{4} d. \\ = \text{£1 9s. 3}\frac{1}{4}d.$$

$$(62) \text{ 5 tons 10 cwt. 2 qrs. 14 lbs. : 3 tons 6 cwt. 1 qr. 14 lbs.} \\ \therefore \text{ £46 8s. 10}\frac{1}{4}d. : \frac{\frac{581}{2} \text{ qrs.} \times \frac{44585}{4} d.}{\frac{885}{2} \text{ qrs.}} = \frac{531 \times 44585 \times 4}{885 \times 2 \times 4} d. \\ = \frac{28751}{4} d., \text{ or £27 17s. 3}\frac{3}{4}d.$$

$$(63) \text{ 3 lbs. 6 oz. 14 dwts. 19 grs. : 7 lbs. 1 oz. 9 dwts. 14 grs.} \\ \therefore \text{ £181 3s. 10}\frac{1}{2}d. : \frac{41030 \text{ grs.} \times 86973}{20515 \text{ grs.} \times 2} d. = 86973d., \text{ or £362 7s. 9d.}$$

$$(64) \text{ 10 yrs. 13 dys. : 333 dys. :: £290 19s. : } \frac{333 \text{ dys.} \times 5819s.}{3663 \text{ dys.}} \\ = 529s., \text{ or £26 9s.}$$

$$(65) \text{ 73 tons 11 cwt. 2 qrs. 27 lbs. : 13 tons 12 cwt. 2 qrs. 5 lbs.} \\ \therefore \text{ 6 cwt. 1 qr. 2 lbs. : } \frac{30625 \times 702}{164835} \text{ lbs.} = 130 \text{ lbs., or 1 cwt.} \\ \text{0 qrs. 18 lbs.}$$

$$(66) \text{ £}79\frac{1}{16} : \text{£}1 :: \text{£}16 \text{ 9s. } 7d. : \frac{\text{£}1 \times 3955d.}{\text{£}79\frac{1}{16}} = \frac{1 \times 3955 \times 10}{791}d. = 50d.,$$

or 4s. 2d.

$$(67) \text{ £}4671 : \text{£}1566 :: \text{£}86\frac{1}{2} : \frac{1566 \times 173}{4671 \times 2}l. = \text{£}29.$$

$$(68) \text{ £}12814\frac{1}{2} : \text{£}1 :: \text{£}3363 \text{ 15s. } 3d. : \frac{\text{£}1 \times 807303d.}{\text{£}3363\frac{1}{2}}$$

$$= \frac{1 \times 807303 \times 3}{38443}d. = 63d., \text{ or } 5s. 3d.$$

$$(69) 4d. : \text{£}12 \text{ 15s. } 6d. :: \text{£}1 : \frac{3066 \times \text{£}1}{4d.} = \text{£}1533 = \text{£}766 \text{ 10s.}$$

$$(70) \text{ i. } 2 \text{ oz. } 6 \text{ drs. } 2 \text{ scr. } 8 \text{ gra.} : 3 \text{ lbs.} :: 76 \text{ dys.}$$

$$: \frac{3 \times 20 \times 3 \times 8 \times 12 \text{ gra.} \times 76 \text{ dys.}}{1368 \text{ gra.}} = 960 \text{ dys.}$$

$$\text{ii. } 1 \text{ oz.} : 3 \text{ lbs.} :: 15\frac{3}{4}s. : \frac{3 \times 12 \text{ oz.} \times \frac{47}{4}s.}{1 \text{ oz.}} = \frac{3 \times 12 \times 47}{3}s. = 564s.,$$

or £28 4s.

$$(71) \text{ £}2796\frac{1}{4} : \text{£}1 :: \text{£}186 \text{ 8s. } 4d. : \frac{\text{£}1 \times 44740d.}{\text{£}2796\frac{1}{4}} = \frac{1 \times 44740 \times 4}{11185}d.$$

= 16d., or 1s. 4d.

$$(72) 1 \text{ oz.} : 53 \text{ lbs. } 4 \text{ oz. } 2 \text{ dwts. } 12 \text{ gra.} :: 4s. 10d.$$

$$: \frac{307260 \text{ gra.} \times 58d.}{20 \times 24 \text{ gra.}} = \frac{148509}{4}d. = \text{£}154 \text{ 13s. } 11\frac{1}{4}d.$$

$$(73) 938 \text{ men} : 201 \text{ men} :: 84 \text{ dys.} : \frac{210 \times 84}{938} \text{ dys.} = 18 \text{ days.}$$

$$(74) \text{ i. } 4 \text{ ft.} : 1 \text{ mile} :: 1 \text{ stroke} : \frac{1760 \times 3 \text{ ft.} \times 1}{4 \text{ ft.}}s. = 1320 \text{ strokes.}$$

$$\text{ii. } 110 \text{ strokes} : 1320 \text{ strokes} :: 3 \text{ min.} : \frac{1320 \times 3}{110} \text{ min.} = 36 \text{ min.}$$

$$(75) 1120 \text{ pages} : 1344 \text{ pages} :: 125\text{th page} : \frac{1344 \times 125}{1120} \text{ p.} = 150\text{th p.}$$

$$(76) 866\frac{1}{4} \text{ ft.} : 404 \text{ yds. } 0 \text{ ft. } 9 \text{ in.} :: 20500 \text{ bricks}$$

$$: \frac{425\frac{1}{4} \text{ ft.} \times 20500}{3465 \times 4} \text{ bricks} = \frac{4851 \times 20500 \times 4}{3465 \times 4} \text{ bricks} = 28700 \text{ bricks.}$$

$$(77) 5d. : \text{£}85 \text{ 7s. } 11d. :: \text{£}1 : \frac{20495d. \times \text{£}1}{5d.} = \text{£}4099.$$

$$(78) \text{ £}61\frac{1}{3} : \text{£}23 :: \text{£}4 : \frac{23 \times 4 \times 3}{184}l. = \text{£}\frac{3}{2}, \text{ or } \text{£}1 \text{ 10s.}$$

$$(79) \text{ 120 tons. 13 cwt. 2 qrs. 16 lbs. : 4 tons :: } £1548 \text{ 15s. 1d.}$$

$$: \frac{4 \times 20 \times 4 \text{ qrs.} \times \frac{£371701}{240}}{27582 \text{ qrs.}} = \frac{4 \times 20 \times 4 \times 371701 \times 7}{240 \times 67682} l. = £154$$

$$= £51 \text{ 6s. 8d.}$$

$$(80) £22\frac{2}{3} : £1092 :: 1 \text{ cwt. 3 qrs. 16 lbs. : } \frac{1092 \times 212 \times 5}{112} \text{ lbs.}$$

$$= 10335 \text{ lbs., or 4 tons 12 cwt. 1 qr. 3 lbs.}$$

$$(81) 9 \text{ lbs. 8 oz. 2 dwts. : 4 lbs. :: } £9 \text{ 13s. 6d. : } \frac{4 \text{ lbs.} \times \frac{287}{20 \times 12} \text{ lbs.}}{2322}$$

$$= \frac{4 \times 387 \times 20 \times 12}{2322 \times 2} s. = 80s., \text{ or } £4.$$

$$(82) 4d. : £15 \text{ 16s. 8d. :: } £1 : \frac{3800d. \times 1}{4d.} l. = £950.$$

$$(83) £30 : £70\frac{2}{3} :: £5\frac{1}{3} : \frac{212 \times 16}{30 \times 3 \times 3} l. = £\frac{1696}{135} = £12 \text{ 11s. } 3\frac{1}{3}d.$$

$$(84) 2 \text{ cwt. 1 qr. 12 lbs. : 1 cwt. :: } £8 \text{ 13s. 3d. : } \frac{112 \text{ lbs.} \times 2079d.}{264 \text{ lbs.}}$$

$$= 882d., \text{ or } £3 \text{ 13s. 6d.}$$

$$(85) £2125 : £212\frac{1}{2} :: £70\frac{5}{8} : \frac{\frac{425}{2} \times \frac{425}{8}}{2125} l. = \frac{425 \times 425}{2125 = 2 \times 6} l. = £\frac{95}{12}$$

$$= £7 \text{ 1s. 8d.}$$

tons	cwt.	qrs.	lbs.	oz.
5	7	1	11	10
2	9	1	19	2

$$(86) 1 \text{ cwt. : } \frac{2 \quad 17 \quad 3 \quad 20 \quad 8}{2 \quad 17 \quad 3 \quad 20 \quad 8} :: £1 \text{ 17s. 4d. : } \frac{103816 \text{ oz.} \times 448d.}{112 \times 16 \text{ oz.}}$$

$$= 25954d., \text{ or } £108 \text{ 2s. 10d.}$$

$$(87) £751\frac{1}{3} : £80\frac{1}{2} :: £60\frac{2}{3} : \frac{\frac{161}{2} \times \frac{182}{3}}{\frac{2254}{3}} l. = \frac{161 \times 182 \times 3}{2254 \times 2 \times 3} l. = £\frac{113}{2} = £6 \text{ 10s.}$$

$$(88) 1 \text{ cwt. : 2 tons 10 cwt. 1 qr. 14 lbs. 14 oz. :: } £2 \text{ 13s. 4d.}$$

$$: \frac{90286 \text{ oz.} \times 640d.}{112 \times 16 \text{ oz.}} = 32245d., \text{ or } £134 \text{ 7s. 1d.}$$

$$(89) 1 \text{ cwt. : 1 cwt. 1 qr. 18 lbs.} \times 700 :: £13 \text{ 10s. 4d.}$$

$$: \frac{158 \times 700 \text{ lbs.} \times 3244d.}{1 \times 112 \text{ lbs.}} = 3203450d., \text{ or } £13347 \text{ 14s. 2d.}$$

$$(90) £3258 \text{ 14s. 8d. : } £814 \text{ 13s. 8d. :: } £1 : \frac{195524d. \times £1}{782096d.} = £\frac{1}{4}, \text{ or } 5s.$$

$$(91) i. \text{ 12 hrs. : 7 hrs. :: 101 dys. 12 hrs. : } \frac{7 \text{ hrs.} \times \frac{293}{12} \text{ dys.}}{12 \text{ hrs.}}$$

$$= \frac{7 \times 203}{12 \times 2} \text{ dys.} = \frac{1421}{24} \text{ dys.} = 2 \text{ months 3 dys. 5 hrs.}$$

- ii. 1 hr. : 1421 hrs. :: 12 mls. : $\frac{1421 \times 12}{1}$ mls. = 17052 miles.
- (92) $17\frac{1}{2}$ mls. : 210 mls. :: 15 min. : $\frac{210 \times 15 \times 2}{35}$ min. = 180 min., or 3 hours.
- (93) i. 20 metres : 1 metre :: 3 pls. 5 yds. 1 ft. $1\frac{1}{2}$ in. : $\frac{1 \text{ m.} \times \frac{3937}{100} \text{ in.}}{20 \text{ m.}}$
 $= \frac{1 \times 3937}{20 \times 5} \text{ in.} = 39\frac{37}{100} \text{ in.}$
- ii. $\frac{3937}{100} \text{ in.} : 7912 \text{ mls.} :: 1 \text{ metre} : \frac{7912 \times 1760 \times 36 \text{ in.} \times 1 \text{ m.}}{\frac{3937}{100} \text{ in.}}$
 $= \frac{7912 \times 1760 \times 36 \times 100}{3937} \text{ metres} = \frac{50130432000}{3937} \text{ metres}$
 $= 12733155\frac{765}{3937} \text{ metres.}$
- (94) 1 sec. : 1 hr. :: $\frac{60}{1}$ yds. : $\frac{60 \times 60 \text{ sec.} \times 80}{1 \text{ sec.} \times 3}$ yds. = 96000 yds., or 54 mls. 4 fms. 14 pls. 3 yds.
- (95) 7310 : 10965 :: 2 hrs. 1 min. 48 sec. : $\frac{10965 \times 7308}{7310}$ sec. = 10962"
 $= 3 \text{ hrs. } 2' 42''.$
- (96) 90 tons 8 cwt. : 361 tons 12 cwt. :: 108 tons 1 hhd. 24 gals.
 $: \frac{7232 \text{ cwt.} \times 27303 \text{ gals.}}{1808 \text{ cwt.}} = 109212 \text{ gals.} = 433 \text{ tuns } 1 \text{ hhd. } 33 \text{ gals.}$
- (97) 1665 c. yds. 13 ft. : 94 c. yds. 17 ft. :: 5 tons 8 cwt. 1 qr. 20 lbs.
 $: \frac{2555 \text{ c. ft.} \times 12144 \text{ lbs.}}{44968 \text{ c. ft.}} = 690 \text{ lbs., or } 6 \text{ cwt. } 0 \text{ qrs. } 18 \text{ lbs.}$
- (98) 11880 soldiers : 4752 soldiers :: 9 cwt. 3 qrs. 13 lbs.
 $: \frac{4752 \times 1105}{11880} \text{ lbs.} = 442 \text{ lbs., or } 3 \text{ cwt. } 3 \text{ qrs. } 22 \text{ lbs.}$
- (99) 35000 strokes : 6250 strokes :: 55 mls. 1088 yds.
 $: \frac{6250 \times 97888}{35900} \text{ yds.} = 17480 \text{ yds., or } 9 \text{ mls. } 1640 \text{ yds.}$
- (100) £1708 : £100 $\frac{4}{5}$:: £50 $\frac{5}{8}$: $\frac{504 \times 305}{1708 \times 5 \times 6} \text{ l.} = \text{£}3.$
- (101) 4d. : £30 8s. 4d. :: £1 : $\frac{7300d. \times 1}{4d.} \text{ l.} = \text{£}1825.$
- (102) 1 ton : 35 lbs. :: £7 4s. : $\frac{35 \text{ lbs.} \times 144}{112 \times 20 \text{ lbs.}} \text{ s.} = \frac{9}{2} \text{ s., or } 2 \text{ s. } 3d.$

$$(103) \text{ £4502}\frac{3}{4} : \text{£1876} :: \text{£90}\frac{1}{2} : \frac{1876 \times 181 \times 5}{22512 \times 2} \text{ l.} = \text{£}\frac{905}{24} = \text{£37 14s. 2d.}$$

$$(104) \text{ £5206}\frac{1}{2} : \text{£3675} :: \text{£416}\frac{1}{2} : \frac{3675 \times 833 \times 4}{20825 \times 2} \text{ l.} = \text{£294.}$$

$$(105) \text{ 3A. 1R. 16P. 11 yds. : 5A. 2R. 12P. 22 yds. :: 4 dys. 6 hrs. 5 min.} \\ : \frac{27005 \text{ yds.} \times 3245}{16225} \text{ min.} = 5401 \text{ min., or 7 dys. 6 hrs. 1 min.}$$

$$(106) \text{ £1406 17s. : £703 8}\frac{1}{2}\text{s. :: £234 9s. 6d. : } \frac{\frac{28137}{2} \times 56274\text{d.}}{28137\text{s.}} \\ = \frac{28137 \times 56274}{28137 \times 2} \text{d.} = 28137\text{d., or £117 4s. 9d.}$$

$$(107) \text{ £331}\frac{1}{8} : \text{£110}\frac{3}{8} :: \text{£21 12s. 6d. : } \frac{883 \times 5190 \times 8}{2649 \times 8} \text{d.} = 1730\text{d., or} \\ \text{£7 4s. 2d.}$$

$$(108) \text{ £55 11s. 6d. : £18 10s. 6d. :: £3 9s. : } \frac{\frac{741}{2} \times 69}{2223} \text{ s.} = \frac{741 \times 69 \times 2}{2223 \times 2} \text{ s.} \\ = 23\text{s., or £1 3s.}$$

$$(109) \text{ 1A. : 563A. 3R. 16P. :: 22}\frac{1}{2}\text{s. : } \frac{90216\text{P.} \times 45}{4 \times 40\text{P.} \times 2} \text{ s.} = \frac{101493}{8} \text{ s.} \\ = \text{£634 6s. 7}\frac{1}{2}\text{d., value of entire farm.}$$

$$\text{1A. : 140A. 3R. 34P. :: 3s. 4d. or } \frac{\text{£}\frac{1}{8} : \frac{22554\text{P.} \times 1}{4 \times 40\text{P.} \times 6}}{\text{£23 9s. 10}\frac{1}{2}\text{d., gain on the portion sublet.}}$$

$$\text{£634 6s. 7}\frac{1}{2}\text{d.} - \text{£23 9s. 10}\frac{1}{2}\text{d.} = \text{£610 16s. 9d.}$$

$$\text{Then, as £634 6s. 7}\frac{1}{2}\text{d. : £610 16s. 9d. :: 22}\frac{1}{2}\text{s. : } \frac{\frac{48867}{4} \times \frac{45}{8}}{\frac{101493}{8}} \text{ s.} \\ = \frac{48867 \times 45 \times 8}{101493 \times 4 \times 2} \text{ s.} = \frac{65}{8} \text{ s., or £1 1s. 8d.}$$

$$(110) \text{ 7 sheep : 500 sheep :: 1A. 3R. : } \frac{500 \times 7}{7 \times 4} \text{ A.} = 125 \text{ acres.}$$

$$7 \times 10 \text{ sheep : 500 \times 52 sheep :: £1}\frac{1}{8} : \frac{500 \times 52 \times 7}{7 \times 10 \times 6} \text{ l.} = \text{£}\frac{1300}{3} \\ = \text{£433 6s. 8d., cost per year.}$$

$$1 \text{ sheep : 500 sheep :: 4 lbs. 8 oz. : } \frac{500 \times 9}{1 \times 2} \text{ lbs.} = 2250 \text{ lbs. of wool.}$$

$$1 \text{ lb. : 2250 lbs. :: 2s. 2d. : } \frac{2250 \times 26}{1} \text{d.} = 58500\text{d., or £243 15s.}$$

$$(111) \frac{1}{2} \text{ lb. : 13}\frac{1}{2} \text{ lbs. :: } \frac{3}{8} \text{ s. : } \frac{55 \times 3 \times 2}{4 \times 5} \text{ s.} = \frac{33}{2} \text{ s., or 16s. 6d.}$$

$$(112) \ 3\frac{1}{2} \text{ cwt.} : 14\frac{1}{2} \text{ cwt.} :: £6 \ 14s. \ 4d. : \frac{29 \times 1612 \times 4}{13 \times 2} d. = 7192d., \text{ or} \\ £29 \ 19s. \ 4d.$$

$$(113) \ £330\frac{3}{4} : £461\frac{7}{10} :: 4\frac{5}{8} \text{ months} : \frac{4617 \times 29 \times 5}{1653 \times 10 \times 6} \text{ mths.} = 3\frac{7}{4} \text{ mths., or} \\ 6\frac{3}{4} \text{ months.}$$

$$(114) \ 7\frac{1}{2} \text{ yds.} : 14\frac{1}{2} \text{ Fr. ells.} :: £9\frac{1}{8} : \frac{\frac{85}{2} \times \frac{6}{1} \text{ yds.} \times £\frac{46}{8}}{\frac{15}{2} \text{ yds.}} = \frac{85 \times 6 \times 46 \times 2}{15 \times 6 \times 5 \times 4} l. \\ = £\frac{321}{15} = £26 \ 1s. \ 4d.$$

$$(115) \ \frac{4\frac{1}{2}}{9} \text{ or } \frac{1}{2} : \frac{7}{15} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \text{ of } 3 :: £976\frac{1}{2} : \frac{7 \times 2 \times 6 \times 3 \times 2929 \times 2}{12 \times 3 \times 7 \times 3} l. \\ £\frac{4555}{3} = £1952 \ 13s. \ 4d.$$

$$(116) \ 12\frac{37}{44} \text{ mls.} : 3\frac{37}{176} \text{ mls.} :: 1 \text{ min.} : \frac{565 \times 44}{565 \times 176} \text{ min.} = \frac{1}{4} \text{ min., or } 15''.$$

$$(117) \ 12705 \text{ men} : 8470 \text{ men} :: 2 \text{ yrs. } 161 \text{ dys.} : \frac{8470 \times 891}{12705} \text{ dys.} \\ = 594 \text{ dys., or } 1 \text{ yr. } 229 \text{ dys.}$$

$$(118) \ 102 \text{ tuns } 1 \text{ pipe } 42 \text{ gals.} : 10 \text{ tuns } 1 \text{ pipe } 42 \text{ gals.} :: £1025 \ 9s. \ 3\frac{1}{2}d. \\ : \frac{2688 \text{ gals.} \times 984445}{25872 \text{ gals.} \times 4} d. = 25570d., \text{ or } £106 \ 10s. \ 10d.$$

$$(119) \ 1411 \text{ yds. } 2 \text{ ft.} : 1129 \text{ yds. } 1 \text{ ft.} :: 31 \text{ ft. } 8 \text{ in.} : \frac{3388 \text{ ft.} \times 380 \text{ in.}}{4235 \text{ ft.}} \\ = 304 \text{ in., or } 25 \text{ ft. } 4 \text{ in.}$$

$$(120) \ £4571 \ 12s. \ 8\frac{1}{2}d. : £870 \ 15s. \ 9d. :: £48 \ 10s. \ 9\frac{1}{2}d. \\ : \frac{208989 \times \frac{46599}{4}}{4388769} d. = \frac{208989 \times 46599 \times 4}{4388769 \times 4} d. = 2219d., \text{ or } £9 \ 4s. \ 11d.$$

$$(121) \ \frac{1}{5} s. : \frac{1}{8} s. :: £1026\frac{1}{4} : \frac{4105 \times 5}{6 \times 4} l. = £\frac{20525}{24} = £855 \ 4s. \ 2d.$$

$$(122) \ 2\frac{2}{3} R. : 12\frac{3}{5} A. :: £\frac{2}{3} : \frac{\frac{63}{2} \times 4 R. \times £\frac{2}{3}}{\frac{12}{5} R.} = \frac{63 \times 4 \times 2 \times 5}{12 \times 5 \times 3} l. = £14.$$

$$(123) \ 6\frac{1}{2} \text{ cwt.} : 1 \text{ cwt.} :: 145\frac{1}{2} \text{ mls.} : \frac{1 \times 581 \times 2}{13 \times 4} \text{ mls.} = \frac{581}{26} \text{ mls.} = 22\frac{9}{26} \text{ mls.}$$

$$(124) \ 92 \text{ cwt. } 2 \text{ qrs. } 2\frac{2}{7} \text{ lbs.} : 15\frac{1}{4} \text{ lbs.} :: £863\frac{4}{7} : \frac{\frac{63}{4} \text{ lbs.} \times £\frac{8045}{7}}{\frac{72540}{7} \text{ lbs.}} \\ = \frac{63 \times 6045 \times 7}{72540 \times 4 \times 7} l. = £\frac{21}{16} = £1 \ 6s. \ 3d.$$

$$(125) \ \frac{4}{5} \text{ lbs.} : 416\frac{1}{8} \text{ cwt.} :: \frac{3229}{8} s. : \frac{\frac{3229}{8} \times 112 \text{ lbs.} \times \frac{7}{8} s.}{\frac{4}{5} \text{ lbs.}} = \frac{3229 \times 112 \times 7 \times 5}{4 \times 8 \times 8} s. \\ = \frac{815905}{16} s. = £2548 \ 15s. \ 3\frac{1}{2}d.$$

$$(126) \quad 3\frac{1}{8} \text{ oz.} : 3\frac{1}{4} \text{ lbs.} :: 14\frac{7}{8} \text{ s.} : \frac{22 \times 12 \text{ oz.} \times 133}{19 \text{ oz.}} = \frac{22 \times 12 \times 133 \times 6}{19 \times 7 \times 9} \text{ s.}$$

= 176 s., or £8 16s.

$$(127) \quad \frac{3}{4} \text{ of } \frac{4}{5} \text{ or } \frac{1}{2} \text{ Fr. ells} : 14\frac{1}{8} \text{ Fr. ells} :: £12\frac{1}{2} : \frac{85 \times 8 \times 2}{6 \times 5} \text{ l.} = £13\frac{2}{5}$$

= £45 6s. 8d.

$$(128) \quad \frac{11\frac{3}{8}}{29} \text{ of } \frac{4\frac{1}{2}}{4\frac{1}{2}} \text{ of } \frac{3\frac{1}{2}}{10\frac{5}{8}} \text{ of 34 lbs.} : 26\frac{3}{8} \times 84 \text{ lbs.} :: 12 \text{ s. } 9 \text{ d.}$$

: $\frac{80 \times 84 \times 153 \times 5 \times 6 \times 4 \times 29 \times 13 \times 85}{58 \times 25 \times 13 \times 3 \times 8 \times 3 \times 34} \text{ d.} = 85680 \text{ d., or } £357.$

$$(129) \quad \frac{3}{8} \text{ lbs.} : 136\frac{1}{4} \text{ cwt.} :: \frac{253}{8} \text{ s.} : \frac{253 \times 112 \text{ lbs.} \times \frac{7}{8}}{\frac{3}{8} \text{ lbs.}} = \frac{953 \times 112 \times 7 \times 8}{3 \times 7 \times 8} \text{ s.}$$

= $\frac{106736}{3} \text{ s.} = £1778 \text{ 18s. } 8 \text{ d.}$

$$(130) \quad \frac{3}{4} : 1 :: £1843\frac{1}{2} : \frac{4 \times 9219}{3 \times 5} \text{ l.} = £1219\frac{2}{5} = £2458 \text{ 8s.}$$

$$(131) \quad 1\frac{1}{4} \text{ A.} : 47\frac{1}{8} \text{ A.} :: £49 \text{ 13s. } 4 \text{ d.} : \frac{377 \times 4 \times 11920}{5 \times 8} \text{ d.} = 449384 \text{ d.}$$

= £1872 8s. 8d.

$$(132) \quad 1\frac{1}{4} \text{ tons} : 93\frac{1}{3} \text{ lbs.} :: £224\frac{5}{8} : \frac{\frac{280}{5} \text{ lbs.} \times £1797}{\frac{5}{4} \times 20 \times 112 \text{ lbs.}}$$

= $\frac{280 \times 1797 \times 4}{5 \times 20 \times 112 \times 3 \times 8} \text{ l.} = £\frac{599}{80} = £7 \text{ 9s. } 9 \text{ d.}$

$$(133) \quad 3\frac{1}{4} \text{ E. ells} : 23\frac{1}{3} \text{ F. ells} :: £7 \text{ 12s. } 2 \text{ d.} : \frac{\frac{70}{27} \times 3 \text{ qrs.} \times 1826 \text{ d.}}{\frac{22}{7} \times 5 \text{ qrs.}}$$

= $\frac{70 \times 3 \times 1826 \times 7}{22 \times 3 \times 5} \text{ d.} = 8134 \text{ d.} = £33 \text{ 17s. } 10 \text{ d.}$

$$(134) \quad \frac{2}{3} \text{ of } \frac{1}{8} : 1 :: £1486\frac{1}{2} : \frac{1 \times 7431 \times 5 \times 6}{3 \times 5} \text{ l.} = £14862.$$

$$(135) \quad \frac{9\frac{7}{8}}{2\frac{1}{27}} \text{ of } \frac{5\frac{2}{11}}{2\frac{7}{11}} \text{ of } \frac{1}{18} : \frac{1\frac{7}{10}}{10\frac{1}{2}} \text{ of } \frac{8\frac{1}{2}}{3\frac{5}{8}} \text{ of } 3 :: £400 \text{ 6s. } 5 \text{ d.}$$

: $\frac{17}{10} \times \frac{5}{81} \times \frac{3}{4} \times \frac{8}{25} \times \frac{3}{1} \times \frac{96077}{1} \times \frac{9}{88} \times \frac{55}{27} \times \frac{11}{58} \times \frac{29}{11} \times \frac{16}{1} \text{ d.}$

= 182215 d. = £759 4s. 7d.

$$(136) \quad \frac{1}{88} \text{ of } \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{7}{10} \text{ of } \frac{3}{4} \text{ of } \frac{10}{13} \text{ of 50 lbs.} : 8 \text{ cwt. } 2 \text{ qrs. } 8 \text{ lbs.} :: 6 \text{ s.}$$

: $\frac{260}{1} \times \frac{6}{1} \times \frac{69}{1} \times \frac{2}{11} \times \frac{5}{8} \times \frac{10}{7} \times \frac{7}{2} \times \frac{3}{10} \times \frac{1}{80} \text{ s.} = 2304 \text{ s.} = £115 \text{ 4s.}$

$$(137) \quad \frac{2}{3} \text{ of } \frac{2}{3} \text{ of 8 tons} : \frac{9}{28} :: 4 \times 21 \text{ s.} : \frac{9}{28} \times \frac{4 \times 21}{1} \times \frac{8}{9} \times \frac{2}{3} \times \frac{1}{8} \text{ s.} = \frac{27}{2} \text{ s.}$$

= 13s. 6d.

$$(138) \quad 14\frac{2}{3} \text{ of } 4\frac{2}{3} \text{ of } \frac{2}{77} \text{ of 10 of 112 lbs.} : 1 \text{ lb.} :: £172\frac{2}{3}$$

: $\frac{264}{4} \times \frac{6}{73} \times \frac{6}{23} \times \frac{77}{9} \times \frac{1}{10} \times \frac{1}{112} \text{ l.} = £\frac{1}{48} = 5 \text{ d.}$

(139) $\frac{12}{25}$ of $\frac{9}{25}$ of $\frac{1}{3}$ of $\frac{4}{7}$ of $\frac{8}{9}$ of 121 of $\frac{4}{11}$ of $\frac{1}{24}$ of $\frac{13}{15}$ of $\frac{1}{4}$ of 126 lbs.

$$: 1 \times 112 \times 20 \text{ lbs.} :: \pounds 11\frac{1}{2} : \frac{112 \times 20}{1} \times \frac{56}{5} \times \frac{26}{15} \times \frac{22}{9} \times \frac{6}{1} \times \frac{7}{4} \times \frac{2}{5} \\ \times \frac{1}{11} \times \frac{1}{4} \times \frac{3}{1} \times \frac{13}{15} \times \frac{1}{24} \times \frac{1}{15} \text{ l.} = \pounds 448.$$

(140) $\frac{7}{8}$ of $\frac{9}{11}$ of $\frac{13}{15}$ of $\frac{17}{19}$ of $\frac{289}{9}$ of $\frac{13}{17}$ of $\frac{8}{15}$ of $\frac{125}{14}$ lbs. : 1 lb. :: $\pounds 3 \text{ 18s. } 1\frac{1}{2}d.$

$$: \frac{8}{7} \times \frac{11}{9} \times \frac{15}{13} \times \frac{17}{15} \times \frac{9}{289} \times \frac{17}{13} \times \frac{15}{8} \times \frac{14}{125} \times \frac{2769}{4} d. = 15d., \text{ or } 1s. 3d.$$

(141) $\frac{4}{5}$ of $\frac{1}{2}$ of $\frac{15}{19}$ of $\frac{243}{901}$ of $\frac{287}{484}$ of $\frac{1802}{152}$ of 25 oz. : 60 \times 12

$$:: \pounds 36 : \frac{5}{4} \times \frac{7}{12} \times \frac{19}{15} \times \frac{901}{243} \times \frac{484}{287} \times \frac{152}{1802} \times \frac{192}{5} \times \frac{1}{95} \times \frac{60 \times 12}{1} \times \frac{291}{1} \\ = \pounds 3024.$$

(142) $\frac{3}{8}$ of $\frac{2}{5}$ of $\frac{9}{11}$ of $5\frac{1}{2}$ of $1\frac{1}{2}$ of $3\frac{3}{4}$ of $2\frac{1}{2}$ of 5 lbs.

$$: \frac{7}{8} \text{ of } \frac{9}{11} \text{ of } \frac{13}{15} \text{ of } \frac{143}{13} \text{ of } 2 \text{ of } 3 \text{ lbs.} :: \pounds 7 \text{ 17s. } 6d. \\ : \frac{8}{3} \times \frac{5}{2} \times \frac{11}{9} \times \frac{15}{13} \times \frac{2}{7} \times \frac{11}{13} \times \frac{2}{5} \times \frac{1}{2} \times \frac{7}{8} \times \frac{11}{15} \times \frac{13}{13} \times \frac{2}{13} \times \frac{14}{3} \times \frac{2}{1} \times \frac{3}{1} \\ \times \frac{1890}{1} d. = 378d., \text{ or } \pounds 1 \text{ 11s. } 6d.$$

(143) $\frac{4}{22}$ of $\frac{2}{23}$ of $\frac{5}{313}$ of $\frac{8}{158}$ of $\frac{10}{11}$ of $\frac{1}{3}$ of 3×112 lbs.

$$: \frac{7}{15} \text{ of } \frac{11}{16} \text{ of } \frac{8}{15} \text{ of } \frac{23}{3} \text{ of } 2 \text{ lbs.} :: \pounds 33 \text{ 12s.} \\ : \frac{5}{4} \times \frac{3}{22} \times \frac{1}{2} \times \frac{8}{3} \times \frac{2}{5} \times \frac{44}{13} \times \frac{5}{8} \times \frac{13}{8} \times \frac{1}{16} \times \frac{4}{3} \times \frac{1}{3 \times 112} \times \frac{7}{8} \times \frac{9}{16} \times \frac{8}{5} \\ \times \frac{10}{7} \times \frac{8}{5} \times \frac{5}{8} \times \frac{8}{3} \times \frac{3}{2} \times \frac{2}{1} \times \frac{272}{1} s. = 4s.$$

(144) 7 ft. : 6 ft. $7\frac{1}{2}$ in. :: 22 ft. : $\frac{238 \text{ ft.} \times 22 \text{ ft.}}{7 \text{ ft.}} = \frac{238 \times 22}{7 \times 36} \text{ ft.} = \frac{187}{9} \text{ ft.}$

$$= 20 \text{ ft. } 9\frac{1}{2} \text{ in.}$$

£	s.	d.
7934	4	8

(145) $1 \times 52 \text{ wks.} : 4 \text{ wks.} :: \frac{268 \quad 18 \quad 11}{7665 \quad 5 \quad 9} : \frac{4 \times 1839669}{52} d.$

$$= 141513d., \text{ or } \pounds 589 \text{ 12s. } 9d.$$

(146) 84 rds. : 42×11 rds. :: 12 denarii : $\frac{42 \times 11 \times 12}{84} d. = 66 \text{ denarii.}$

Then, as 7 denarii : 66 denarii :: 4s. 2d. : $\frac{66 \times 50}{7} d. = \frac{3300}{7} d.$

$$= \pounds 1 \text{ 19s. } 3\frac{3}{7}d.$$

(147) 22 ft. : 31 yds. 2 ft. 4 in. :: 7 ft. : $\frac{288 \times 7}{22} \text{ ft.} = \frac{288 \times 7}{22 \times 3} \text{ ft.}$

$$= \frac{27}{3} \text{ ft.} = 30\frac{1}{3} \text{ ft.}$$

- (148) i. 22 ft. 6 in. : 56 yds. 3 qrs. 2 nls. :: 3 qrs.

$$: \frac{910}{4 \times 4} \text{ yds.} \times \frac{3}{4} \times 3 \text{ ft.} = \frac{910 \times 3 \times 3 \times 2 \times 3}{45 \times 4 \times 4 \times 4} \text{ ft.} = \frac{273}{16} \text{ ft.}$$

$$= 17 \text{ ft. } 0\frac{1}{2} \text{ in.}$$

ii. 1 yd. : 56 yds. 3 qrs. 2 nls. :: 4s. 8d. : $\frac{910}{4 \times 4} \text{ yds.} \times 56d.$

$$= \frac{910 \times 56}{4 \times 4} d. = 3185d. = £13 \text{ } 5s. \text{ } 5d.$$

(149) $\frac{1\frac{1}{2}(7 + \frac{3}{4} + \frac{3}{4})}{\frac{1}{12}(1\frac{3}{4} + 2\frac{1}{4} + 3\frac{1}{4})}$ of £50 = $\frac{5}{4} \times \frac{12\frac{1}{2}}{12} \times \frac{1}{2} \times \frac{13}{12} \times \frac{50}{1}$.

$$= £800.$$

$\frac{5}{8}$ of $\frac{5}{9}$ of $1\frac{1}{2}$ of $\frac{7}{8}$ of $2\frac{1}{2}$ of $\frac{1}{3}$ of $1\frac{3}{4}$ of $\frac{3}{4}$: 1 :: £800

$$: \frac{5}{4} \times \frac{5}{9} \times \frac{3}{2} \times \frac{7}{8} \times \frac{5}{3} \times \frac{3}{4} \times \frac{1}{2} \times \frac{13}{12} \times \frac{800}{1} = £2400.$$

(150) $\frac{\frac{7}{12}}{3 + \frac{5}{12}} + \frac{\frac{30}{7}}{7 + \frac{5}{8}}$ of $\frac{5}{25} = \frac{7}{8\frac{1}{2}} + \frac{30}{7\frac{1}{2}}$ of $\frac{5}{25} = (\frac{1}{10} + \frac{1}{4})$ of $\frac{5}{25} = \frac{1}{5}$

$\frac{1}{5} : \frac{5}{8}$ of $\frac{7}{8}$ of $\frac{5}{9}$:: £5000

$: \frac{5}{8} \times \frac{7}{8} \times \frac{5}{9} \times \frac{5}{8} \times \frac{5}{8} \times \frac{5}{8} \times \frac{1}{5} \times \frac{5000}{1} = £7500.$

- (151) If 5000 have provisions for 4 months, for how long ought it to last 3000?

3000 : 5000 :: 4 mths. : $\frac{5 \times 4}{3}$ mths. = $\frac{20}{3}$ or $6\frac{2}{3}$ months.

As half as much more provisions are bought in, the garrison will be victualled for $6\frac{2}{3} + 3\frac{1}{3}$ or 10 months.

- (152) i. 4512816 panes : 5427576 panes :: 38013 sq. yds. 0 ft. 60 in.

$: \frac{5427576 \times 49264908}{4512816} \text{ in.} = 59251038 \text{ in.} = 45718 \text{ sq. yds.}$

3 ft. 78 in.

ii. Cost = $\frac{59251038}{144} \text{ ft.} \times 9d. = \frac{52625519}{8} d. = £15429 \text{ } 19s. \text{ } 1\frac{1}{2}d.$

- (153) i. 5732 reams 17 $\frac{1}{2}$ quires : 28695 reams 11 quires

:: 3 cwt. 3 qrs. 17 lbs. 10 oz. : $\frac{573911 \times 4 \times 7002}{458631} \text{ oz.}$

= 35048 oz. = 19 cwt. 2 qrs. 6 lbs. 8 oz.

$$\text{ii. Value} = \frac{573911 \times 24}{12} \times \frac{5}{2}d = 2862555d = £11956 \text{ 9s. } 7d.$$

$$(154) \text{ i. } 5 \text{ dys.} : 144 \text{ dys.} :: 10000000 \text{ gals.} : \frac{144 \times 10000000}{5} \text{ oz.} \\ = 288000000 \text{ gallons.}$$

$$\text{ii. Weight} = \frac{288000000}{16} \times \frac{11021}{4} \times \frac{1}{1728} \times \frac{1000}{1} \text{ oz.} = 4621250000 \text{ oz.} \\ = 1289411 \text{ tons } 5 \text{ cwt. } 1 \text{ qr. } 22 \text{ lbs.}$$

$$\text{iii. Each day's pumping throws in } \frac{2000000}{10} \times 2772\frac{3}{4} \text{ c. in.} \\ = 50000 \times 11091 \text{ c. in. of water.}$$

$$\text{Area of river} = \frac{125}{8} \times \frac{1760}{1} \times \frac{3}{1} \times \frac{1}{1} = 1650000 \text{ sq. ft.}$$

$$\therefore \text{increase in depth} = \frac{50000 \times 11091}{1650000 \times 144} \text{ in.} = \frac{3897}{1584} = 2\frac{529}{1584} \text{ in.}$$

$$155) \text{ i. Reservoir contains } 288000000 \text{ gallons.}$$

$$\therefore \text{number of sq. ft. in reservoir} = \left(\frac{11021}{4} \times \frac{1}{1728} \right) \text{ ft.} \times \frac{288000000}{1} \\ = \frac{554550000}{12}.$$

$$\therefore \text{depth} = \frac{554550000}{12} \text{ c. ft.} \div (1026 \text{ yds. } 2\frac{5}{8} \text{ ft.} \times 416 \text{ yds. } 2 \text{ ft.}) \\ = \frac{554550000}{12} \times \frac{6}{18485} \times \frac{1}{1250} = 12 \text{ feet.}$$

$$\text{ii. Time it would last} = 288000000 \div 400000 = 720 \text{ days} \\ = 1 \text{ yr. } 355 \text{ days.}$$

EXERCISE XLVII., p. 84.

$$(1) \quad \left. \begin{array}{l} 9 \text{ horses} : 20 \text{ horses} \\ 16 \text{ dys.} : 21 \text{ dys.} \end{array} \right\} :: 36 \text{ bushels.}$$

$$\text{Then } \frac{20 \times 21 \times 36}{9 \times 16} \text{ bush.} = 105 \text{ bushels.}$$

$$(2) \quad \left. \begin{array}{l} 3 \text{ men} : 15 \text{ men} \\ 6 \text{ dys.} : 27 \text{ dys.} \end{array} \right\} :: £6\frac{1}{3}.$$

$$\text{Then } \frac{15 \times 27 \times 20}{3 \times 6 \times 3} l. = £150.$$

$$(3) \quad \left. \begin{array}{l} 9 \text{ persons} : 6 \text{ persons} \\ 24 \text{ pks.} : 36 \text{ pks.} \end{array} \right\} :: 25 \text{ days.}$$

$$\text{Then } \frac{6 \times 36 \times 25}{9 \times 24} \text{ dys.} = 25 \text{ days.}$$

- (4) $\begin{array}{l} £150 : £180 \\ 9 \text{ months} : 6 \text{ months} \end{array} \left. \vphantom{\begin{array}{l} £150 : £180 \\ 9 \text{ months} : 6 \text{ months} \end{array}} \right\} :: 10 \text{ persons.}$
 Then $\frac{180 \times 6 \times 10}{150 \times 9} \text{ persons} = 8 \text{ persons.}$
- (5) $\begin{array}{l} 20\text{A.} : 15\text{A.} \\ 24 \text{ hrs.} : 16 \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 20\text{A.} : 15\text{A.} \\ 24 \text{ hrs.} : 16 \text{ hrs.} \end{array}} \right\} :: 20 \text{ men.}$
 Then $\frac{15 \times 16 \times 20}{20 \times 24} \text{ men} = 10 \text{ men.}$
- (6) $\begin{array}{l} 12 \text{ men} : 36 \text{ men} \\ 30 \text{ dys.} : 20 \text{ dys.} \end{array} \left. \vphantom{\begin{array}{l} 12 \text{ men} : 36 \text{ men} \\ 30 \text{ dys.} : 20 \text{ dys.} \end{array}} \right\} :: £15.$
 Then $\frac{36 \times 20 \times 15}{12 \times 30} \text{ £} = £30.$
- (7) $\begin{array}{l} 8 \text{ horses} : 4 \text{ horses} \\ 13\text{A.} : 52\text{A.} \end{array} \left. \vphantom{\begin{array}{l} 8 \text{ horses} : 4 \text{ horses} \\ 13\text{A.} : 52\text{A.} \end{array}} \right\} :: 20 \text{ days.}$
 Then $\frac{4 \times 52 \times 20}{8 \times 13} \text{ dys.} = 40 \text{ days.}$
- (8) $\begin{array}{l} 4 \text{ dys.} : 7 \text{ dys.} \\ 10 \text{ hrs.} : 8 \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 4 \text{ dys.} : 7 \text{ dys.} \\ 10 \text{ hrs.} : 8 \text{ hrs.} \end{array}} \right\} :: 100 \text{ miles.}$
 Then $\frac{7 \times 8 \times 100}{4 \times 10} \text{ mls.} = 140 \text{ miles.}$
- (9) $\begin{array}{l} 4 \text{ men} : 6 \text{ men} \\ 2 \text{ dys.} : 5 \text{ dys.} \end{array} \left. \vphantom{\begin{array}{l} 4 \text{ men} : 6 \text{ men} \\ 2 \text{ dys.} : 5 \text{ dys.} \end{array}} \right\} :: 10 \text{ acres.}$
 Then $\frac{6 \times 5 \times 10}{4 \times 2} \text{ A.} = \frac{75}{2} \text{ A.} = 37\text{A. } 2\text{R.}$
- (10) $\begin{array}{l} 5 \text{ men} : 15 \text{ men} \\ 2 \text{ dys.} : 14 \text{ dys.} \end{array} \left. \vphantom{\begin{array}{l} 5 \text{ men} : 15 \text{ men} \\ 2 \text{ dys.} : 14 \text{ dys.} \end{array}} \right\} :: 25s.$
 Then $\frac{15 \times 14 \times 25}{5 \times 2} s. = 525s. = £26 \text{ } 5s.$
- (11) $\begin{array}{l} 16 \text{ cwt.} : 2 \times 20 \text{ cwt.} \\ £10 : £5 \end{array} \left. \vphantom{\begin{array}{l} 16 \text{ cwt.} : 2 \times 20 \text{ cwt.} \\ £10 : £5 \end{array}} \right\} :: 20 \text{ miles.}$
 Then $\frac{2 \times 20 \times 5 \times 20}{16 \times 10} \text{ mls.} = 25 \text{ miles.}$
- (12) $\begin{array}{l} 8 \text{ men} : 6 \text{ men} \\ 18 \text{ dys.} : 30 \text{ dys.} \\ 12 \text{ hrs.} : 8 \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 8 \text{ men} : 6 \text{ men} \\ 18 \text{ dys.} : 30 \text{ dys.} \\ 12 \text{ hrs.} : 8 \text{ hrs.} \end{array}} \right\} :: £20.$
 Then $\frac{6 \times 30 \times 8 \times 20}{8 \times 18 \times 12} \text{ £} = \frac{£60}{3} = £16 \text{ } 13s. \text{ } 4d.$

$$(13) \quad \left. \begin{array}{l} 12\text{A.} : 39\text{A.} \\ 9 \text{ dys.} : 30 \text{ dys.} \end{array} \right\} :: 12 \text{ horses.}$$

Then $\frac{39 \times 30 \times 12}{12 \times 9} \text{ horses} = 130 \text{ horses.}$

$$(14) \quad \left. \begin{array}{l} 6 \text{ men} : 9 \text{ men} \\ 7 \text{ dys.} : 35 \text{ dys.} \end{array} \right\} :: 15s.$$

Then $\frac{9 \times 35 \times 15}{6 \times 7} s. = 225s. = \pounds 11 \text{ 5s.}$

$$(15) \quad \left. \begin{array}{l} 5 \text{ men} : 7 \text{ men} \\ 5 \text{ dys.} : 4 \text{ dys.} \\ 14 \text{ hrs.} : 10 \text{ hrs.} \end{array} \right\} :: 30 \text{ acres.}$$

Then $\frac{7 \times 4 \times 10 \times 30}{5 \times 5 \times 14} \text{A.} = 24 \text{ acres.}$

$$(16) \quad \left. \begin{array}{l} 5 \text{ men.} : 10 \text{ men} \\ 100 \times 4 \times 3 \text{ yds.} : 45 \times 6 \times 4 \text{ yds.} \end{array} \right\} :: 40 \text{ days.}$$

Then $\frac{10 \times 45 \times 6 \times 4 \times 40}{5 \times 100 \times 4 \times 3} \text{ dys.} = 72 \text{ days.}$

$$(17) \quad \left. \begin{array}{l} 5 \text{ horses} : 56 \text{ horses} \\ 30 \text{ bushels} : 50 \text{ bushels} \\ 20 \text{ dys.} : 15 \text{ dys.} \end{array} \right\} :: 3 \text{ oxen.}$$

Then $\frac{56 \times 50 \times 15 \times 3}{5 \times 30 \times 20} \text{ oxen} = 42 \text{ oxen.}$

$$(18) \quad \left. \begin{array}{l} \pounds 3 : \pounds 60 \\ 1 : 1\frac{1}{2} \\ 15 \text{ dys.} : 11 \text{ dys.} \\ 10 \text{ hrs.} : 9 \text{ hrs.} \end{array} \right\} :: 2 \text{ navvies.}$$

Then $\frac{60 \times 5 \times 11 \times 9 \times 2}{3 \times 15 \times 10 \times 3} \text{ navvies} = 44 \text{ navvies.}$

$$(19) \quad \left. \begin{array}{l} 24 \text{ men} : 90 \text{ men} \\ 2 \text{ dys.} : 4 \text{ dys.} \\ 12 \text{ hrs.} : 9 \text{ hrs.} \\ 5 \times 3 \text{ yds.} : 4 \times 2 \text{ yds.} \end{array} \right\} :: 132 \text{ yards.}$$

Then $\frac{90 \times 4 \times 9 \times 4 \times 2 \times 132}{24 \times 2 \times 12 \times 5 \times 3} \text{ yds.} = 393 \text{ yards.}$

$$\left. \begin{array}{l} 100 \times 6 \times 12 : 80 \times 6 \times 12 \\ 18 \text{ dys.} : 6 \text{ dys.} \end{array} \right\} :: 180 \text{ men.}$$

$$\text{Then } \frac{80 \times 6 \times 12 \times 6 \times 180}{100 \times 6 \times 12 \times 18} \text{ men} = 48 \text{ men.}$$

$\frac{2}{3} = 50$ miles \therefore the express can travel 50 miles more than the ordinary train in 6 hours.

the ordinary train travels 250 miles in 6 hours \therefore the express travels 300 miles in 6 hours.

$$\left. \begin{array}{l} 20 \text{ panes} : 36 \text{ panes} \\ 2 \times 1\frac{1}{2} \text{ ft.} : 1\frac{1}{4} \times \frac{3}{4} \text{ ft.} \end{array} \right\} :: £1\frac{1}{2}.$$

$$\text{Then } \frac{36 \times 5 \times 3 \times 3 \times 2}{20 \times 2 \times 3 \times 4 \times 4 \times 2} l. = £\frac{27}{11} = 16s. 10\frac{1}{2}d.$$

$$\left. \begin{array}{l} 573 \text{ men} : 190 \text{ men} \\ 1 : 3 \end{array} \right\} :: 15 \text{ days.}$$

$$\text{Then } \frac{190 \times 3 \times 15}{573} \text{ dys.} = 15 \text{ days.}$$

$$\left. \begin{array}{l} 20 \text{ bus.} : 80 \text{ bus.} \\ 3 \text{ dys.} : 2 \text{ dys.} \\ 8 \text{ hrs.} : 10 \text{ hrs.} \end{array} \right\} :: 3 \text{ men.}$$

$$\text{Then } \frac{80 \times 2 \times 10 \times 3}{20 \times 3 \times 8} \text{ men} = 10 \text{ men.}$$

$$\left. \begin{array}{l} 2 \text{ men} : 3 \text{ men} \\ 1 \text{ dy.} : 4 \text{ dys.} \\ 8 \text{ hrs.} : 6 \text{ hrs.} \end{array} \right\} :: 800 \text{ geraniums.}$$

$$\text{Then } \frac{3 \times 4 \times 6 \times 800}{2 \times 1 \times 8} g. = 3600 \text{ geraniums.}$$

$$\left. \begin{array}{l} 16 \text{ horses} : 24 \text{ horses} \\ 40 \text{ dys.} : 12 \text{ dys.} \\ 10 \text{ hrs.} : 9 \text{ hrs.} \end{array} \right\} :: 30 \text{ acres.}$$

$$\text{Then } \frac{24 \times 12 \times 9 \times 30}{16 \times 40 \times 10} A. = \frac{243}{20} A. = 12A. 24P.$$

$$\left. \begin{array}{l} £166\frac{2}{3} : £333\frac{1}{3} \\ 20 \text{ dys.} : 15 \text{ dys.} \\ 12 \text{ hrs.} : 10 \text{ hrs.} \end{array} \right\} :: 108 \text{ men.}$$

$$\text{Then } \frac{1000 \times 15 \times 10 \times 108 \times 3}{500 \times 20 \times 12 \times 3} \text{ men} = 135 \text{ men.}$$

$$(28) \quad \begin{array}{l} 40 \text{ bars} : 20 \text{ bars} \\ 2 : 1 \end{array} \left. \vphantom{\begin{array}{l} 40 \text{ bars} : 20 \text{ bars} \\ 2 : 1 \end{array}} \right\} :: 10\frac{1}{4} \text{ tons.}$$

$$\text{Then } \frac{20 \times 1 \times 41}{40 \times 2 \times 4} \text{ tons} = \frac{41}{16} \text{ tons} = 2 \text{ tons } 11 \text{ cwt. } 1 \text{ qr.}$$

$$(29) \quad 100 \times 5 \times 1 \text{ ft} : 200 \times 6 \times 1\frac{1}{4} \text{ ft.} :: 40 \text{ masons.}$$

$$\text{Then } \frac{200 \times 6 \times 5 \times 40}{100 \times 5 \times 1 \times 4} \text{ m.} = 120 \text{ masons.}$$

(30) In 50 miles the steamer goes 5 × 50 or 250 knots more than sailing ship.

$$\therefore \text{ as } 500 + 250 \text{ or } 750 \text{ knots} : 600 \text{ knots} :: 50 \text{ hours.}$$

$$\text{Then } \frac{600 \times 50}{750} \text{ hours} = 40 \text{ hours.}$$

$$(31) \quad 72 \times 4 \times 8 \text{ yds.} : 80 \times 4 \times 6 \text{ yds.} :: 36 \text{ men.}$$

$$\text{Then } \frac{80 \times 4 \times 6 \times 36}{72 \times 4 \times 8} \text{ men} = 80 \text{ men.}$$

$$(32) \quad \begin{array}{l} 19 \text{ men} : 49 \text{ men} \\ 7 \text{ dys.} : 2 \text{ dys.} \\ 8 \text{ hrs.} : 10 \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 19 \text{ men} : 49 \text{ men} \\ 7 \text{ dys.} : 2 \text{ dys.} \\ 8 \text{ hrs.} : 10 \text{ hrs.} \end{array}} \right\} :: £49\frac{1}{13}.$$

$$\text{Then } \frac{49 \times 2 \times 10 \times 589}{19 \times 7 \times 8 \times 12} \text{ l.} = £\frac{1135}{24} = £45 \text{ 4s. } 2d.$$

$$(33) \quad \begin{array}{l} 21 \text{ men} : 7 \text{ men} \\ 80 \times 3\frac{3}{4} \times 6 \text{ ft.} : 160 \times 6\frac{3}{4} \times 4 \text{ ft.} \\ 8 \text{ hrs.} : 6\frac{1}{4} \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 21 \text{ men} : 7 \text{ men} \\ 80 \times 3\frac{3}{4} \times 6 \text{ ft.} : 160 \times 6\frac{3}{4} \times 4 \text{ ft.} \\ 8 \text{ hrs.} : 6\frac{1}{4} \text{ hrs.} \end{array}} \right\} :: 15 \text{ da. s.}$$

$$\text{Then } \frac{7 \times 160 \times 27 \times 4 \times 25 \times 15 \times 4}{21 \times 80 \times 15 \times 6 \times 8 \times 4 \times 4} \text{ dys.} = \frac{75}{8} \text{ dys.} = 9\frac{3}{8} \text{ day.}$$

$$(34) \quad \begin{array}{l} 4 \text{ horses} : 2 \text{ horses} \\ 2 \text{ dys.} : 5 \text{ dys.} \\ 10\frac{2}{3} \text{ hrs.} : 9\frac{1}{3} \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 4 \text{ horses} : 2 \text{ horses} \\ 2 \text{ dys.} : 5 \text{ dys.} \\ 10\frac{2}{3} \text{ hrs.} : 9\frac{1}{3} \text{ hrs.} \end{array}} \right\} :: 20 \text{ acres.}$$

$$\text{Then } \frac{2 \times 5 \times 28 \times 20 \times 3}{4 \times 2 \times 32 \times 3} \text{ A.} = \frac{175}{8} \text{ A.} = 21\frac{7}{8} \text{ A.}$$

$$(35) \quad \begin{array}{l} 16\text{s.} : 48\text{s.} \\ 2 \times 2\frac{1}{4} \text{ ft.} : \frac{3}{4} \times \frac{2}{3} \text{ ft.} \end{array} \left. \vphantom{\begin{array}{l} 16\text{s.} : 48\text{s.} \\ 2 \times 2\frac{1}{4} \text{ ft.} : \frac{3}{4} \times \frac{2}{3} \text{ ft.} \end{array}} \right\} :: 14 \text{ panes.}$$

$$\text{Then } \frac{48 \times 3 \times 2 \times 14 \times 4}{16 \times 2 \times 9 \times 4 \times 3} \text{ panes} = \frac{14}{3} \text{ or } 4\frac{2}{3} \text{ panes.}$$

- 6)
$$\left. \begin{array}{l} 600 \text{ men} : 500 \text{ men} \\ £7168\frac{1}{2} : £8600 \\ 300 \text{ dys.} : 200 \text{ dys.} \end{array} \right\} :: 8 \text{ hours.}$$

 Then $\frac{500 \times 8600 \times 200 \times 8 \times 3}{600 \times 21600 \times 300} \text{ hrs.} = \frac{1}{3}^{\circ} \text{ or } 5\frac{1}{2} \text{ hours.}$
- 7)
$$\left. \begin{array}{l} 100 \times 1 \times 5 \text{ ft.} : 150 \times 2 \times 6 \text{ ft.} \\ 100 \times 1 \times 5 \end{array} \right\} :: 5000 \text{ bricks.}$$

 Then $\frac{150 \times 2 \times 6 \times 5000}{100 \times 1 \times 5} \text{ bricks} = 18000 \text{ bricks.}$
- 3)
$$\left. \begin{array}{l} 100 \times 3 \text{ ft.} : 120 \times 5 \text{ ft.} \\ 1\frac{1}{2} : 1 \end{array} \right\} :: 6000 \text{ stones.}$$

 Then $\frac{120 \times 5 \times 5000 \times 3}{100 \times 3 \times 5} \text{ stones} = 6000 \text{ stones.}$
- 9)
$$\left. \begin{array}{l} 24 \text{ copyists} : 20 \text{ copyists} \\ 30 \text{ lines} : 24 \text{ lines} \\ 500 \text{ pages} : 600 \text{ pages} \end{array} \right\} :: 6 \text{ days.}$$

 Then $\frac{20 \times 24 \times 600 \times 6}{24 \times 30 \times 500} \text{ dys.} = \frac{1}{5}^{\circ} \text{ or } 4\frac{1}{5} \text{ days.}$
- 0)
$$\left. \begin{array}{l} 330 \times 10 \times 4 \text{ yds.} : 440 \times 8 \times 4 \text{ yds.} \\ 100 \text{ dys.} : 40 \text{ dys.} \\ 12 \text{ hrs.} : 9 \text{ hrs.} \end{array} \right\} :: 400 \text{ navvies.}$$

 Then $\frac{440 \times 8 \times 4 \times 40 \times 9 \times 400}{330 \times 10 \times 4 \times 100 \times 12} \text{ navvies} = 128 \text{ navvies.}$

EXERCISE XLVIII., p. 87.

$$\begin{array}{r|l} 2s. \ 6d. & \frac{1}{8} \left| \begin{array}{l} (1) \\ 17 @ £4 \ 2s. \ 6d. \\ \hline 4 \\ \hline 68 \\ 2 \ 2 \ 6 \\ \hline £70 \ 2s. \ 6d. \end{array} \right. \end{array}$$

$$\begin{array}{r|l} 10s. & \frac{1}{2} \left| \begin{array}{l} (2) \\ 37 @ £9 \ 15s. \\ \hline 9 \\ \hline 333 \\ 5s. \ \frac{1}{2} \left| \begin{array}{l} 18 \ 10 \\ \hline 9 \ 5 \\ \hline £360 \ 15s. \end{array} \right. \end{array} \right. \end{array}$$

$$\begin{array}{r|l} 5s. & \frac{1}{4} \left| \begin{array}{l} (3) \\ 23 @ £3 \ 5s. \\ \hline 3 \\ \hline 69 \\ 5 \ 15 \\ \hline £74 \ 15s. \end{array} \right. \end{array}$$

$$\begin{array}{r|l} 10s. & \frac{1}{2} \left| \begin{array}{l} (4) \\ 31 @ £12 \ 10s. \\ \hline 12 \\ \hline 372 \\ 15 \ 10 \\ \hline £387 \ 10s. \end{array} \right. \end{array}$$

(5)

10s.	$\frac{1}{2}$	41 @ £7 16s. 8d.
		7
		<hr/> 287
6s. 8d.	$\frac{1}{3}$	20 10
		13 13 4
		<hr/> £321 3s. 4d.

(6)

10s.	$\frac{1}{2}$	43 @ £6 13s. 4d.
		6
		<hr/> 258
3s. 4d.	$\frac{1}{3}$	21 10
		7 3 4
		<hr/> £286 13s. 4d.

(7)

10s.	$\frac{1}{2}$	73 @ £3 10s. 6d.
		3
		<hr/> 219
6d.	$\frac{1}{20}$	36 10
		1 16 6
		<hr/> £257 6s. 6d.

(8)

10s.	$\frac{1}{2}$	47 @ £8 12s. 6d.
		8
		<hr/> 376
2s. 6d.	$\frac{1}{4}$	23 10
		5 17 6
		<hr/> £405 7s. 6d.

(9)

10s.	$\frac{1}{2}$	39 @ £2 15s. 5d.
		2
		<hr/> 78
5s.	$\frac{1}{2}$	19 10
5d.	$\frac{1}{12}$	9 15
		16 3
		<hr/> £108 1s. 3d.

(10)

10s.	$\frac{1}{2}$	93 @ £4 11s. 8d.
		4
		<hr/> 372
1s. 8d.	$\frac{1}{6}$	46 10
		7 15
		<hr/> £426 5s.

(11)

5s.	$\frac{1}{4}$	75 @ £7 9s. 6d.
		7
		<hr/> 525
2s. 6d.	$\frac{1}{2}$	18 15
2d.	$\frac{1}{10}$	9 7 6
		7 10 0
		<hr/> £560 12s. 6d.

(12)

10s.	$\frac{1}{2}$	65 @ £7 12s. 9d.
		7
		<hr/> 455
2s. 6d.	$\frac{1}{4}$	32 10
3d.	$\frac{1}{10}$	8 2 6
		16 3
		<hr/> £496 8s. 9d.

(13)

6s. 8d.	$\frac{1}{3}$	59 @ £6 8s. 4d.
		6
		<hr/> 354
1s. 8d.	$\frac{1}{4}$	19 13 4
		4 18 4
		<hr/> £378 11s. 8d.

(14)

5s.	$\frac{1}{4}$	86 @ £3 6s. 6d.
		3
		<hr/> 258
1s. 3d.	$\frac{1}{4}$	21 10
3d.	$\frac{1}{5}$	5 7 6
		1 1 6
		<hr/> £285 19s. 0d.

(15)

10s.	$\frac{1}{2}$	97 @ £12 13s. 8d.
		12
		<hr/> 1164
3s. 4d.	$\frac{1}{8}$	48 10
4d.	$\frac{1}{10}$	16 3 4
		1 12 4
		<hr/> £1230 5s. 8d.

(16)

10s.	$\frac{1}{2}$	75 @ £10 17s. 6d.
		10
		<hr/> 750
5s.	$\frac{1}{2}$	37 10
2s. 6d.	$\frac{1}{4}$	18 15
		9 7 6
		<hr/> £815 12s. 6d.

(17)

10s.	$\frac{1}{2}$	103 @ £2 10s. 10d.
		2
		<hr/> 206
10d.	$\frac{1}{12}$	51 10
		4 5 10
		<hr/> £261 15s. 10d.

(18)

10s.	$\frac{1}{2}$	117 @ £3 13s. 6d.
		3
		<hr/> 351
2s. 6d.	$\frac{1}{4}$	58 10
1s.	$\frac{1}{10}$	14 12 6
		5 17 0
		<hr/> £429 19s. 6d.

(19)

10s.	$\frac{1}{2}$	76 @ £5 13s. 9d.
		5
		<hr/> 380
3s. 4d.	$\frac{1}{8}$	38
5d.	$\frac{1}{20}$	12 13 4
		1 11 8
		<hr/> £432 5s. 0d.

(20)

6s. 8d.	$\frac{1}{8}$	83 @ £1 7s. 8d.
1s.	$\frac{1}{20}$	27 13 4
		4 3 0
		<hr/> £114 16s. 4d.

EXERCISE XLIX., p. 87.

(1)		(2)			
10s.	$\frac{1}{2}$	51 @ £7 11s. 3d.	3s. 4d.	$\frac{1}{8}$	113 @ £7 3s. 7d.
		7			7
		<u>357</u>			<u>791</u>
1s. 3d.	$\frac{1}{8}$	25 10	3d.	$\frac{1}{80}$	18 16 8
		3 3 9			1 8 3
		<u>£385 13s. 9d.</u>			<u>£811 4s. 11d.</u>

(3)		(4)			
10s.	$\frac{1}{2}$	53 @ £11 17s. 5d.	10s.	$\frac{1}{2}$	29 @ £6 13s. 2d.
		11			6
		<u>583</u>			<u>174</u>
6s. 8d.	$\frac{1}{3}$	26 10	2s. 6d.	$\frac{1}{3}$	14 10
8d.	$\frac{1}{10}$	17 13 4	8d.	$\frac{1}{15}$	3 12 6
1d.	$\frac{1}{6}$	1 15 4			19 4
		4 5			<u>£193 1s. 10d.</u>
		<u>£629 3s. 1d.</u>			

(5)		(6)			
6s. 8d.	$\frac{1}{3}$	57 @ £7 6s. 9d.	3s. 4d.	$\frac{1}{8}$	79 @ £3 3s. 11d.
		7			3
		<u>399</u>			<u>237</u>
1d.	$\frac{1}{80}$	19	6d.	$\frac{1}{40}$	13 3 4
		0 4 9	1d.	$\frac{1}{8}$	1 19 6
		<u>£418 4s. 9d.</u>			6 7
					<u>£252 9s. 5d.</u>

(7)		(8)			
10s.	$\frac{1}{2}$	37 @ £2 13s. 7d.	4s.	$\frac{1}{5}$	87 @ £9 4s. 8d.
		2			9
		<u>74</u>			<u>783</u>
3s. 4d.	$\frac{1}{8}$	18 10	8d.	$\frac{1}{8}$	17 8
3d.	$\frac{1}{40}$	6 3			2 18
		9 3			<u>£803 6s.</u>
		<u>£99 2s. 7d.</u>			

(9)

10s.	$\frac{1}{2}$	43 @ £5 17s. 3d.
		5
		<hr/> 215
6s. 8d.	$\frac{1}{3}$	21 10
6d.	$\frac{1}{20}$	14 6 8
1d.	$\frac{1}{8}$	1 1 6
		3 7
		<hr/> £252 1s. 9d.

(10)

2s. 6d.	$\frac{1}{3}$	93 @ £1 3s. 2d.
8d.	$\frac{1}{20}$	11 12 6
		3 2 0
		<hr/> £107 14s. 6d.

(11)

10s.	$\frac{1}{2}$	61 @ £10 18s. 5d.
		10
		<hr/> 610
6s. 8d.	$\frac{1}{3}$	30 10
1s. 3d.	$\frac{1}{8}$	20 6 8
6d.	$\frac{1}{20}$	3 16 3
		1 10 6
		<hr/> £666 3s. 5d.

(12)

6s. 8d.	$\frac{1}{3}$	67 @ £13 9s. 7d.
		13
		<hr/> 871
2s. 6d.	$\frac{1}{3}$	22 6 8
5d.	$\frac{1}{8}$	8 7 6
		1 7 11
		<hr/> £903 2s. 1d.

(13)

6s. 8d.	$\frac{1}{3}$	119 @ £3 9s. 10d.
		3
		<hr/> 357
2s. 6d.	$\frac{1}{3}$	39 13 4
8d.	$\frac{1}{20}$	14 17 6
		3 19 4
		<hr/> £415 10s. 2d.

(14)

10s.	$\frac{1}{2}$	131 @ £2 17s. 3d.
		2
		<hr/> 262
6s. 8d.	$\frac{1}{3}$	65 10
6d.	$\frac{1}{20}$	43 13 4
1d.	$\frac{1}{8}$	3 5 6
		10 11
		<hr/> £374 19s. 9d.

(15)

6s. 8d.	$\frac{1}{3}$	123 @ £6 7s. 10d.
		6
		<hr/> 738
1s.	$\frac{1}{20}$	41
2d.	$\frac{1}{8}$	6 3
		1 0 6
		<hr/> £786 3s. 6d.

(16)

6s. 8d.	$\frac{1}{3}$	59 @ £3 9s. 3d.
		3
		<hr/> 177
2s. 6d.	$\frac{1}{3}$	19 13 4
1d.	$\frac{1}{20}$	7 7 6
		4 11
		<hr/> £204 5s. 9d.

(17)

10s.	$\frac{1}{2}$	123 @ £9 14s. 6d.
		9
		<hr/> 1107
4s.	$\frac{1}{8}$	61 10
6d.	$\frac{1}{8}$	24 12
		3 1 6
		<hr/> £1196 3s. 6d.

(18)

10s.	$\frac{1}{2}$	97 @ £7 11s. 9d.
		7
		<hr/> 679
1s. 3d.	$\frac{1}{8}$	48 10
6d.	$\frac{1}{20}$	6 1 3
		2 8 6
		<hr/> £735 19s. 9d.

(19)

10s.	$\frac{1}{2}$	73 @ £5 16s. 5d.
		5
		<hr/> 365
5s.	$\frac{1}{2}$	36 10
1s. 3d.	$\frac{1}{4}$	18 5
2d.	$\frac{1}{50}$	4 11 3
		12 2
		<hr/> £424 18s. 5d.

(20)

10s.	$\frac{1}{2}$	137 @ £8 12s. 7d.
		8
		<hr/> 1096
2s. 6d.	$\frac{1}{4}$	68 10
1d.	$\frac{1}{30}$	17 2 6
		11 5
		<hr/> £1182 3s. 11d.

EXERCISE L., p. 88.

(1)

10s.	$\frac{1}{2}$	23 @ £8 12s. 2d.
		8
		<hr/> 184
2s.	$\frac{1}{8}$	11 10
2d.	$\frac{1}{12}$	2 6
		3 10
		<hr/> £197 19s. 10d.

(2)

4s.	$\frac{1}{8}$	65 @ £3 9s. 10d.
		3
		<hr/> 195
5s.	$\frac{1}{4}$	13
10d.	$\frac{1}{6}$	16 5
		2 14 2
		<hr/> £226 19s. 2d.

(3)

10s.	$\frac{1}{2}$	43 @ £6 15s. 7d.
		6
		<hr/> 258
5s.	$\frac{1}{2}$	21 10
6d.	$\frac{1}{4}$	10 15
1d.	$\frac{1}{8}$	1 1 6
		3 7
		<hr/> £291 10s. 1d.

(4)

3s. 4d.	$\frac{1}{8}$	91 @ £2 4s. 9d.
		2
		<hr/> 182
1s. 3d.	$\frac{1}{16}$	15 3 4
2d.	$\frac{1}{20}$	5 13 9
		15 2
		<hr/> £203 12s. 3d.

(5)

s. 8d.	$\frac{1}{3}$	79 @ £4 7s. 11d.
		4
		<u>316</u>
s. 3d.	$\frac{1}{18}$	26 6 8
		4 18 9
		<u>£347 5s. 5d.</u>

(6)

3s. 4d.	$\frac{1}{3}$	31 @ £1 3s. 5d.
1d.	$\frac{1}{40}$	5 3 4
		<u>2 7</u>
		<u>£36 5s. 11d.</u>

(7)

10s.	$\frac{1}{2}$	59 @ £5 17s. 3d.
		5
		<u>295</u>
s. 8d.	$\frac{1}{3}$	29 10
6d.	$\frac{1}{20}$	19 13 4
1d.	$\frac{1}{8}$	1 9 6
		4 11
		<u>£345 17s. 9d.</u>

(8)

4s.	$\frac{1}{5}$	87 @ £7 8s. 6d.
		7
		<u>609</u>
4s.	$\frac{1}{5}$	17 8
6d.	$\frac{1}{8}$	17 8
		2 3 6
		<u>£645 19s. 6d.</u>

(9)

10s.	$\frac{1}{2}$	107 @ £15 13s. 2d.
		15
		<u>1605</u>
s. 6d.	$\frac{1}{4}$	53 10
8d.	$\frac{1}{13}$	13 7 6
		3 11 4
		<u>£1675 8s. 10d.</u>

(10)

10s.	$\frac{1}{2}$	136 @ £2 18s. 3d.
		2
		<u>272</u>
6s. 8d.	$\frac{1}{3}$	68
1s. 3d.	$\frac{1}{8}$	45 6 8
4d.	$\frac{1}{20}$	8 10 0
		2 5 4
		<u>£396 2s. 0d.</u>

(11)

10s.	$\frac{1}{2}$	172 @ £1 15s. 7d.
5s.	$\frac{1}{2}$	86
6d.	$\frac{1}{10}$	43
1d.	$\frac{1}{8}$	4 6 8
		14 4
		<u>£306 0s. 4d.</u>

(12)

4s.	$\frac{1}{5}$	101 @ £6 8s. 3d.
		6
		<u>606</u>
4s.	$\frac{1}{5}$	20 4
3d.	$\frac{1}{18}$	20 4
		1 5 3
		<u>£647 13s. 3d.</u>

(13)

5s.	$\frac{1}{4}$	207 @ £5 7s. 5d.
		5
		1035
5d.	$\frac{1}{12}$	51 5
2s.	$\frac{1}{10}$	4 6 3
		20 14 0
		£1111 15s. 3d.

(14)

10s.	$\frac{1}{2}$	362 @ £1 9s. 7d.
5d.	$\frac{1}{24}$	181
		543 0 0
		7 10 10 } <i>subtr.</i>
		£535 9s. 2d.

(15)

5s.	$\frac{1}{4}$	572 @ £4 6s. 2d.
		4
		2288
1s.	$\frac{1}{8}$	143
2d.	$\frac{1}{8}$	28 12
		4 15 4
		£2464 7s. 4d.

(16)

5s.	$\frac{1}{4}$	321 @ £3 5s. 9d.
		3
		963
6d.	$\frac{1}{10}$	80 5
3d.	$\frac{1}{2}$	8 0 6
		4 0 3
		£1055 5s. 9d.

(17)

10s.	$\frac{1}{2}$	146 @ £12 18s. 5d.
		12
		1752
4s.	$\frac{1}{8}$	73
4s.	$\frac{1}{5}$	29 4
5d.	$\frac{1}{24}$	29 4
		3 0 10
		£1886 8s. 10d.

(18)

10s.	$\frac{1}{2}$	131 @ £7 11s. 8d.
		7
		917
1s. 6d.	$\frac{1}{8}$	65 10
		10 18 4
		£993 8s. 4d.

(19)

6d.	$\frac{1}{10}$	297 @ £6 19s. 6d.
		7
		2079
		7 8 6 } <i>subtr.</i>
		£2071 11s. 6d.

(20)

		£	s.	d.
10s.	$\frac{1}{2}$	761 @ 15 14 11		
		15		
		11415		
5s.	$\frac{1}{2}$	380 10		
1d.	$\frac{1}{80}$	190 5		
		11985 15 0		
		3 3 5 } <i>sub.</i>		
		£11982 11s. 7d.		

EXERCISE LI., p. 88.

(1)

		37 @ £2 5s. 9½d.
		2
5s.	¼	74
6d.	1/10	9 5
3d.	½	18 6
2d.	¼	9 3
		2 3½
		£84 15s. 0½d.

(2)

2s. 6d.	⅙	75 @ £7 3s. 2½d.
		7
		525
8d.	3/30	9 7 6
½d.	1/18	2 10 0
		3 1½
		£537 0s. 7½d.

(3)

5s.	¼	67 @ £4 7s. 6½d.
		4
		268
2s. 6d.	½	16 15
½d.	1/20	8 7 6
		1 4½
		£293 3s. 10½d.

(4)

10s.	½	29 @ £9 11s. 3½d.
		9
		261
1s. 3d.	⅙	14 10
½d.	1/30	1 16 3
		1 2½
		£277 7s. 5½d.

(5)

10s.	½	59 @ £6 13s. 2½d.
		6
		354
2s. 6d.	¼	29 10
8d.	1/15	7 7 6
½d.	1/32	1 19 4
		1 2½
		£392 18s. 0½d.

(6)

10s.	½	31 @ 10s. 8¾d.
		15 10
8d.	1/15	1 0 8
½d.	1/10	1 3½
¼d.	½	7½
		£16 12s. 7¼d.

(7)

3s. 4d.	⅙	53 @ 3s. 9½d.
		8 16 8
5d.	⅙	1 2 1
½d.	1/10	2 2½
		£10 0s. 11½d.

(8)

1s.	1/20	71 @ 1s. 2¼d.
		3 11
2d.	⅙	11 10
½d.	¼	2 11½
¼d.	½	1 5½
		£4 7s. 3½d.

(9)

10s.	$\frac{1}{2}$	97 @ 11s. 10 $\frac{1}{4}$ d.
1s.	$\frac{1}{10}$	48 10
10d.	$\frac{1}{12}$	4 17
$\frac{1}{4}$ d.	$\frac{1}{20}$	4 0 10
		2 0 $\frac{1}{4}$
		£57 9s. 10 $\frac{1}{4}$ d.

(10)

5s.	$\frac{1}{4}$	23 @ 7s. 5 $\frac{1}{2}$ d.
2s. 6d.	$\frac{1}{2}$	5 15
$\frac{1}{4}$ d.	$\frac{1}{60}$	2 17 6
		8 12 6
		11 $\frac{1}{2}$ } <i>subtr.</i>
		£8 11s. 6 $\frac{1}{2}$ d.

(11)

6s. 8d.	$\frac{1}{3}$	89 @ 9s. 7 $\frac{1}{4}$ d.
2s. 6d.	$\frac{1}{6}$	29 13 4
5d.	$\frac{1}{6}$	11 2 6
$\frac{1}{4}$ d.	$\frac{1}{20}$	1 17 1
		1 10 $\frac{1}{4}$
		£42 14s. 9 $\frac{1}{4}$ d.

(12)

6s. 8d.	$\frac{1}{3}$	121 @ 8s. 3 $\frac{1}{4}$ d.
1s. 8d.	$\frac{1}{4}$	40 6 8
$\frac{1}{4}$ d.	$\frac{1}{60}$	10 1 8
		50 8 4
		2 6 $\frac{1}{4}$ } <i>subtr.</i>
		£50 5s. 9 $\frac{1}{4}$ d.

(13)

2s. 6d.	$\frac{1}{3}$	265 @ 2s. 9 $\frac{1}{2}$ d.
3d.	$\frac{1}{10}$	33 2 6
$\frac{1}{2}$ d.	$\frac{1}{6}$	3 6 3
		11 0 $\frac{1}{2}$
		£36 19s. 9 $\frac{1}{2}$ d.

(14)

10s.	$\frac{1}{2}$	137 @ 17s. 4 $\frac{1}{4}$ d.
6s. 8d.	$\frac{1}{3}$	68 10
8d.	$\frac{1}{10}$	45 13 4
$\frac{1}{2}$ d.	$\frac{1}{16}$	4 11 4
$\frac{1}{4}$ d.	$\frac{1}{2}$	5 8 $\frac{1}{4}$
		2 10 $\frac{1}{2}$
		£119 3s. 2 $\frac{1}{4}$ d.

(15)

10s.	$\frac{1}{2}$	529 @ 14s. 6 $\frac{1}{4}$ d.
4s.	$\frac{1}{5}$	264 10
6d.	$\frac{1}{8}$	105 16
$\frac{1}{4}$ d.	$\frac{1}{24}$	13 4 6
		11 0 $\frac{1}{4}$
		£384 1s. 6 $\frac{1}{4}$ d.

(16)

10s.	$\frac{1}{2}$	468 @ 16s. 10 $\frac{1}{2}$ d.
6s. 8d.	$\frac{1}{3}$	234
2 $\frac{1}{2}$ d.	$\frac{1}{32}$	156
		4 17 6
		£394 17s. 6d.

(17)

10s.	$\frac{1}{2}$	627 @ 13s. 5 $\frac{1}{2}$ d.
3s. 4d.	$\frac{1}{3}$	313 10
1 $\frac{1}{2}$ d.	$\frac{1}{36}$	104 10
		3 5 3 $\frac{1}{2}$
		<u>£421 5s. 3$\frac{1}{2}$d.</u>

(18)

10s.	$\frac{1}{2}$	356 @ 15s. 2 $\frac{1}{2}$ d.
5s.	$\frac{1}{2}$	178
3d.	$\frac{1}{20}$	89
$\frac{1}{2}$ d.	$\frac{1}{12}$	4 9
		271 9 0
		7 5 } <i>subtr.</i>
		<u>£271 1s. 7d.</u>

(19)

10s.	$\frac{1}{2}$	284 @ 12s. 7 $\frac{1}{2}$ d.
2s. 6d.	$\frac{1}{4}$	142
1 $\frac{1}{2}$ d.	$\frac{1}{20}$	35 10
		1 15 6
		<u>£179 5s. 6d.</u>

(20)

10s.	$\frac{1}{2}$	739 @ 18s. 11 $\frac{1}{2}$ d.
5s.	$\frac{1}{2}$	369 10
3s. 4d.	$\frac{1}{3}$	184 15
7 $\frac{1}{2}$ d.	$\frac{1}{18}$	123 3 4
$\frac{1}{2}$ d.	$\frac{1}{30}$	23 1 10 $\frac{1}{2}$
		15 4 $\frac{1}{2}$
		<u>£701 5s. 7$\frac{1}{2}$d.</u>

EXERCISE LII., p. 89.

(1)

2 qrs.	$\frac{1}{2}$	£ s. d.
		5 16 8
		6
		<u>35 0 0</u>
14 lbs.	$\frac{1}{4}$	2 18 4
7 lbs.	$\frac{1}{2}$	14 7
8 oz.	$\frac{1}{14}$	7 3 $\frac{1}{2}$
		6 $\frac{1}{2}$
		<u>£39 0s. 8$\frac{1}{2}$d.</u>

(2)

2 cwt.	$\frac{1}{10}$	£ s. d.
		60 10 8
		3
		<u>181 12 0</u>
2 qrs.	$\frac{1}{4}$	6 1 0 $\frac{1}{2}$
1 qr.	$\frac{1}{2}$	1 10 3 $\frac{1}{2}$
7 lbs.	$\frac{1}{4}$	15 1 $\frac{1}{2}$
		3 9 $\frac{1}{2}$
		<u>£190 2s. 3d.</u>

(3)

5 cwt.	$\frac{1}{4}$	£ s. d.
		4 11 2
		5
		<u>22 15 10</u>
2 qrs.	$\frac{1}{10}$	1 2 9 $\frac{1}{2}$
14 lbs.	$\frac{1}{4}$	2 3 $\frac{7}{20}$
		6 $\frac{17}{20}$
		<u>£24 1s. 5$\frac{11}{16}$d.</u>

(4)

1 qr.	$\frac{1}{4}$	£ s. d.
		4 15 6
		3
		<u>14 6 6</u>
7 lbs.	$\frac{1}{4}$	1 3 10 $\frac{1}{2}$
14 oz.	$\frac{1}{8}$	5 11 $\frac{1}{8}$
		8 $\frac{1}{8}$
		<u>£15 17s. 1$\frac{1}{2}$d.</u>

(5)			
	£	s.	d.
2 qrs.	$\frac{1}{2}$	4	16 8
			8
		38	13 4
1 qr.	$\frac{1}{2}$	2	8 4
7 lbs.	$\frac{1}{4}$	1	4 2
4 lbs.	$\frac{1}{4}$		6 0 $\frac{1}{2}$
8 oz.	$\frac{1}{8}$	3	5 $\frac{3}{4}$
			5 $\frac{5}{8}$
£42 15s. 9 $\frac{3}{8}$ d.			

(6)			
	£	s.	d.
10 cwt.	$\frac{1}{2}$	12	10 8
4 cwt.	$\frac{1}{8}$		4
		50	2 8
		6	5 4
2 qrs.	$\frac{1}{8}$	2	10 1 $\frac{3}{5}$
8 lbs.	$\frac{1}{4}$	6	3 $\frac{1}{2}$
			10 $\frac{26}{35}$
£59 5s. 3 $\frac{19}{35}$ d.			

(7)			
	£	s.	d.
		5	16 8
			6
6 bus.	$\frac{1}{8}$	35	0 0
2 pks.	$\frac{1}{12}$	4	7 6
1 gal.	$\frac{1}{4}$	7	3 $\frac{1}{2}$
		1	9 $\frac{7}{8}$
£39 16s. 7 $\frac{3}{8}$ d.			

(8)			
	£	s.	d.
2 qts.	$\frac{1}{2}$	4	19 6
			7
		34	16 6
1 qt.	$\frac{1}{2}$	2	9 9
1 pt.	$\frac{1}{2}$	1	4 10 $\frac{1}{2}$
			12 5 $\frac{1}{2}$
£39 3s. 6 $\frac{1}{2}$ d.			

(9)			
	£	s.	d.
4 bus.	$\frac{1}{2}$	6	14 6
			3
		20	3 6
2 pks.	$\frac{1}{8}$	3	7 3
1 gal.	$\frac{1}{4}$	8	4 $\frac{7}{8}$
2 qts.	$\frac{1}{2}$	2	1 $\frac{7}{32}$
		1	0 $\frac{39}{64}$
£24 2s. 3 $\frac{45}{64}$ d.			

(10)			
	£	s.	d.
6 oz.	$\frac{1}{2}$	50	6 8
			4
		201	6 8
12 dwts.	$\frac{1}{10}$	25	3 4
16 grs.	$\frac{1}{18}$	2	10 4
		2	9 $\frac{5}{9}$
£229 3s. 1 $\frac{5}{9}$ d.			

(11)			
	£	s.	d.
10 dwts.	$\frac{1}{2}$	1	11 6 × 63
			9
		14	3 6
			7
		99	4 6
5 dwts.	$\frac{1}{2}$		15 9
15 grs.	$\frac{1}{2}$		7 10 $\frac{1}{2}$
			11 $\frac{13}{16}$
£100 9s. 1 $\frac{5}{16}$ d.			

(12)			
	£	s.	d.
4 oz.	$\frac{1}{3}$	8	12 6
8 dwts.	$\frac{1}{10}$	2	17 6
15 grs.	$\frac{1}{12}$		5 9
			5 $\frac{1}{2}$
£11 16s. 2 $\frac{1}{2}$ d.			

(13)

	£	s.	d.
oz.	$\frac{1}{2}$	9 16	8
			2
		19 13	4
oz.	$\frac{1}{2}$	4 18	4
rs.	$\frac{1}{4}$	2 9	2
cr.	$\frac{1}{8}$	12	$3\frac{1}{2}$
		1	$4\frac{7}{16}$
	£27 14s. $5\frac{3}{4}$ d.		

(14)

	£	s.	d.
4 oz.	$\frac{1}{2}$	2 1	4
			5
		10 6	8
1 oz.	$\frac{1}{4}$	13	$9\frac{1}{2}$
4 drs.	$\frac{1}{2}$	3	$5\frac{1}{2}$
1 scr.	$\frac{1}{12}$	1	$8\frac{2}{3}$
4 grs.	$\frac{1}{8}$		$11\frac{1}{8}$
			$0\frac{39}{80}$
	£11 5s. $9\frac{3}{4}$ d.		

(15)

	£	s.	d.
ds	$\frac{1}{2}$	2 16	4×16
			4
		11 5	4
			4
		45 1	4
od	$\frac{1}{2}$	1 8	2
ls.	$\frac{1}{2}$	14	1
ls.	$\frac{1}{2}$	7	$0\frac{1}{2}$
		3	$6\frac{1}{2}$
	£47 14s. $1\frac{3}{4}$ d.		

(16)

	£	s.	d.
2r.	$\frac{1}{2}$	1 6	8×47
			9
		12 0	0
			5
		60 0	0
		2 13	4
20p.	$\frac{1}{4}$	13	4
8p.	$\frac{1}{10}$	3	4
		1	4
	£63 11s. 4d.		

(17)

	£	s.	d.
ft.	$\frac{1}{2}$	0 16	8
			5
		4 3	4
in.	$\frac{1}{2}$	5	$6\frac{2}{3}$
in.	$\frac{1}{2}$	2	$9\frac{1}{2}$
			$11\frac{1}{2}$
	£4 12s. $7\frac{1}{2}$ d.		

(18)

	£	s.	d.
1 ft.	$\frac{1}{2}$	0 14	8×24
			6
		4 8	0
			4
		17 12	0
6 in.	$\frac{1}{2}$	4	$10\frac{2}{3}$
1 in.	$\frac{1}{8}$	2	$5\frac{1}{2}$
			$4\frac{8}{9}$
	£17 19s. $8\frac{8}{9}$ d.		

(19)

	£	s.	d.
4 bus.	$\frac{1}{2}$	4 16	8
			2
		9 13	4
1 bus.	$\frac{1}{4}$	2 8	4
2 pks.	$\frac{1}{2}$	12	1
1 gal.	$\frac{1}{4}$	6	$0\frac{1}{2}$
2 qts.	$\frac{1}{2}$	1	$6\frac{1}{8}$
1 qt	$\frac{1}{4}$		$9\frac{1}{16}$
			$4\frac{17}{32}$
	£13	2s. 5	$\frac{7}{32}d.$

(20)

	£	s.	d.
1 ft.	$\frac{1}{3}$	1 4	7
			8
		9 16	8
6 in.	$\frac{1}{2}$	8	$2\frac{1}{3}$
4 in.	$\frac{1}{3}$	4	$1\frac{1}{6}$
1 in.	$\frac{1}{4}$	2	$8\frac{7}{8}$
			$8\frac{7}{32}$
	£10	12s. 4	$\frac{17}{32}d.$

(21)

	£	s.	d.
1 ft.	$\frac{1}{3}$	0 19	5×15
			3
		2 18	3
			5
		14 11	3
6 in.	$\frac{1}{3}$	6	$5\frac{3}{8}$
2 in.	$\frac{1}{3}$	3	$2\frac{5}{8}$
		1	$0\frac{17}{16}$
	£15	2s. 0	$\frac{4}{8}d.$

(22)

	£	s.	d.
6 oz.	$\frac{1}{2}$	2 17	9
			4
		11 11	0
1 oz.	$\frac{1}{6}$	1 8	$10\frac{1}{2}$
4 drs.	$\frac{1}{2}$	4	$9\frac{1}{4}$
2 scr.	$\frac{1}{8}$	2	$4\frac{7}{8}$
			$4\frac{39}{48}$
	£13	7s. 5	$\frac{15}{16}d.$

(23)

	£	s.	d.
4 drs.	$\frac{1}{2}$	0 7	6×27
			9
		3 7	6
			3
		10 2	6
1 dr.	$\frac{1}{4}$	3	9
$1\frac{1}{2}$ scr.	$\frac{1}{2}$		$11\frac{1}{4}$
			$5\frac{5}{8}$
	£10	7s. 7	$\frac{1}{8}d.$

(24)

	£	s.	d.
1 scr. 16 grs.	$\frac{1}{160}$	6 10	0
			10
		65 0	0
			$9\frac{1}{2}$
	£64	19s. 2	$\frac{1}{4}d.$

} sub

(25)

	£	s.	d.
Oz. $\frac{1}{2}$	15	13	8
			3
	47	1	0
Oz. $\frac{1}{8}$	7	16	10
vtls. $\frac{1}{2}$	1	6	$1\frac{3}{4}$
vtls. $\frac{1}{5}$		13	$0\frac{5}{8}$
vtls. $\frac{1}{2}$		5	$2\frac{11}{12}$
		2	$7\frac{11}{30}$
	£57	4s.	$10\frac{2}{3}d.$

(26)

	£	s.	d.
10 dwts. $\frac{1}{2}$	3	17	3×90
			10
	38	12	6
			9
	347	12	6
4 dwts. $\frac{1}{8}$	1	18	$7\frac{1}{2}$
4 dwts. $\frac{1}{8}$		15	$5\frac{3}{4}$
8 grs. $\frac{1}{12}$		15	$5\frac{3}{4}$
		1	$3\frac{2}{10}$
	£351	3s.	$3\frac{1}{2}d.$

(27)

	£	s.	d.
2R. $\frac{1}{2}$	43	10	8×20
			5
	217	13	4
			4
	870	13	4
Op. $\frac{1}{8}$	21	15	4
8P. $\frac{1}{10}$	2	14	5
	2	3	$6\frac{2}{5}$
	£897	6s.	$7\frac{2}{5}d.$

(28)

	£	s.	d.
Ir. $\frac{1}{4}$	48	9	7×30
			6
	290	17	6
			5
	1454	7	6
8P. $\frac{1}{8}$	12	2	$4\frac{1}{2}$
	2	8	$5\frac{1}{2}$
	£1468	18s.	$4\frac{1}{2}d.$

(29)

	£	s.	d.
lay $\frac{1}{7}$	0	16	$1\frac{3}{4} \times 19$
			4
	3	4	7
			4
	12	18	4
	2	8	$5\frac{1}{4}$
		2	$3\frac{19}{28}$
	£15	9s.	$0\frac{13}{14}d.$

(30)

	£	s.	d.
1 day $\frac{1}{7}$	1	2	6×22
			2
	2	5	0
			11
	24	15	0
1 day $\frac{1}{7}$		3	$2\frac{1}{7}$
1 day $\frac{1}{7}$		3	$2\frac{1}{7}$
		3	$2\frac{1}{7}$
	£25	4s.	$7\frac{1}{4}d.$

EXERCISE LIII., p. 90.

(1)		(2)			
5s.	$\frac{1}{4}$	365 @ 5s. 3d.	2R.	$\frac{1}{2}$	325 @ 1A. 2R. 10P.
3d.	$\frac{1}{20}$	91 5	10P.	$\frac{1}{8}$	162 2
		4 11 3			20 1 10
		£95 16s. 3d.			507A. 3R. 10P.

(3)		(4)			
5 dwts.	$\frac{1}{4}$	£ s. d.	10s.	$\frac{1}{2}$	£ s. d. i. d.
		5 13 4			11573 6 8 @ 15 6
		2 15	5s.	$\frac{1}{2}$	5786 13 4
		1388 6 8	6d.	$\frac{1}{10}$	2893 6 8
12 grs.	$\frac{1}{10}$	1 8 4	$\frac{3}{4}$ d.	$\frac{1}{8}$	289 6 8
8 grs.	$\frac{1}{12}$	2 10			36 3 4
		1 10 $\frac{2}{3}$			£9005 10s. 0d.
		£1389 19s. 8 $\frac{2}{3}$ d.			

(5)		(6)			
2R.	$\frac{1}{2}$	£ s. d.	10s.	$\frac{1}{2}$	£ s. d. i. d.
		1 8 4			5329 16 8 @ 10
		3000	6d.	$\frac{1}{20}$	2664 18 4
		4250 0 0	3d.	$\frac{1}{2}$	133 4 11
1R.	$\frac{1}{2}$	14 2			66 12 5 $\frac{1}{2}$
20P.	$\frac{1}{2}$	7 1			£2864 15s. 8 $\frac{1}{2}$ d.
10P.	$\frac{1}{2}$	3 6 $\frac{1}{2}$			
		1 9 $\frac{1}{2}$			
		£4251 6s. 6 $\frac{1}{2}$ d.			

(7) Intended gain per ton = £252 ÷ 120 = £2 2s.

∴ price per ton = £8 8s. + £2 2s. = £10 10s.

Gain per cent. = $\frac{100 \times 2\frac{1}{10}}{8\frac{2}{3}}\% = \frac{100 \times 21 \times 5}{42 \times 10} = 25$ per cent.

4s.	$\frac{1}{2}$	120 @ £8 8s. per ton.	10s.	$\frac{1}{2}$	120 @ £9 10s. 1
		8			9 [u
4s.	$\frac{1}{2}$	960			1080
		24			60
		24			£1140 selling price

£1008 cost price.

∴ gain = £1140 - £1008 = £132.

∴ gain per cent. = $\frac{100 \times 132}{1008} = \frac{275}{21} = 13\frac{2}{21}$ per cent.

(8)		(9)	
6	210	10s.	$\frac{1}{2}$
3s. 4d.	$\frac{1}{8}$		$\frac{1}{8}$
	35 @ £1 3s. 4d. per wk. 1s. 8d.		9632 6 3 @ 11 8
	5 16 8		4816 3 1 $\frac{1}{2}$ in £1.
	£40 16s. 8d.		802 13 10 $\frac{1}{4}$
			£5618 16s. 11 $\frac{1}{4}$ d.

(10)

Net income = £1 - 3s. 6d = 16s. 6d. 280A. 3R. 10P. @ £1 12s. per acre.

		£	s.	d.
10s.	$\frac{1}{2}$	5396	10	5 @ 16 6 in £1. 2R.
5s.	$\frac{1}{2}$	2698	5	2 $\frac{1}{2}$
1s.	$\frac{1}{5}$	1349	2	7 $\frac{1}{4}$
6d.	$\frac{1}{2}$	269	16	6 $\frac{1}{4}$
		134	18	3 $\frac{1}{2}$
		£4452 2s. 7 $\frac{1}{2}$ d.		

(11)

		£	s.	d.
$\frac{1}{2}$		1	12	0
		230		
		368	0	0
1R.	$\frac{1}{2}$	16	0	0
10P.	$\frac{1}{4}$	8	0	0
		2 0		
		£369 6s. 0d.		

30A. 3R. 10P. @ 4s. 6d. per acre. 642A. 2R. 24P. @ £1 7s. 6d. per acre.	
2R.	$\frac{1}{2}$
	£ s. d.
	0 4 6
	230
	51 15 0
1R.	$\frac{1}{2}$
	2 3
10P.	$\frac{1}{4}$
	1 1 $\frac{1}{2}$
	3 $\frac{3}{8}$
	£51 18s. 7 $\frac{7}{8}$ d. gain.
2R.	$\frac{1}{2}$
	£ s. d.
	1 7 6
	642
	882 15 0
20P.	$\frac{1}{4}$
	13 9
4P.	$\frac{1}{5}$
	3 5 $\frac{1}{4}$
	8 $\frac{1}{4}$
	£883 12s. 10 $\frac{1}{2}$ d.
∴ cost of farm = £883 12s. 10 $\frac{1}{2}$ d. - £51 18s. 7 $\frac{7}{8}$ d. = £831 14s. 2 $\frac{5}{8}$ d.	

2) By selling, gain = £1 1s. 8d. - 18s. 4d. = 3s. 4d. per ton.

80 tons 15 cwt. 2 qrs.

@ 3s. 4d. per ton.

0 cwt.	$\frac{1}{2}$	£ s. d.
		0 3 4
		80
		13 6 8
5 cwt.	$\frac{1}{2}$	1 8
2 qrs.	$\frac{1}{10}$	10
		1
		£13 9s. 3d. gain.

80 tons 15 cwt. 2 qrs.

@ 18s. 4d. per ton.

10 cwt.	$\frac{1}{2}$	£ s. d.
		0 18 4
		80
		73 6 8
5 cwt.	$\frac{1}{2}$	9 2
2 qrs.	$\frac{1}{10}$	$\frac{1}{2}$ 7
		5 $\frac{1}{2}$
		£74 0s. 10 $\frac{1}{2}$ d. cost.

(13)

$$\begin{array}{r|l}
 \text{4s.} & \frac{1}{2} \\
 \text{1d.} & \frac{1}{48}
 \end{array}
 \left| \begin{array}{l}
 \text{£} \\
 3500 \\
 700 \\
 14 \ 11 \ 8
 \end{array} \right.
 \begin{array}{l}
 @ \ 4s. \ 1d. \ \text{in} \ \text{£}1. \\
 \\
 \\
 \hline
 \text{£}714 \ 11s. \ 8d. \ \text{taxes.}
 \end{array}$$

$$\text{Net income} = \text{£}3500 - \text{£}714 \ 11s. \ 8d. = \text{£}2785 \ 8s. \ 4d.$$

$$\begin{aligned}
 \text{Money saved in 10 years} &= (\text{£}2785 \ 8s. \ 4d. - \text{£}2300) \times 10 \\
 &= \text{£}485 \ 8s. \ 4d. \times 10 = \text{£}4854 \ 3s. \ 4d.
 \end{aligned}$$

(14)

3 lbs. 4 oz. 5 drs.
@ 12s. 9d. per oz.

1 lb. 8 oz. 6 drs. 0 scr. 16 grs.
@ 2s. 6d. per dr.

$$\begin{array}{r|l}
 4 \text{ drs.} & \frac{1}{2} \\
 1 \text{ dr.} & \frac{1}{4}
 \end{array}
 \left| \begin{array}{l}
 \text{£} \ s. \ d. \\
 0 \ 12 \ 9 \\
 40 \\
 \hline
 25 \ 10 \ 0 \\
 6 \ 4\frac{1}{2} \\
 1 \ 7\frac{1}{8}
 \end{array} \right.
 \begin{array}{r|l}
 10 \text{ grs.} & \frac{1}{8} \\
 6 \text{ grs.} & \frac{1}{16}
 \end{array}
 \left| \begin{array}{l}
 \text{£} \ s. \ d. \\
 0 \ 2 \ 6 \\
 166 \\
 \hline
 20 \ 15 \ 0 \\
 5 \\
 3
 \end{array} \right.$$

$\text{£}25 \ 17s. \ 11\frac{5}{8}d. \ \text{C.P. of whole.} \qquad \text{£}20 \ 15s. \ 8d.$

$$\text{Then } \text{£}25 \ 17s. \ 11\frac{5}{8}d. - \text{£}20 \ 15s. \ 8d. = \text{£}5 \ 2s. \ 3\frac{5}{8}d.$$

$$\begin{aligned}
 \therefore \text{quantity required to liquidate debt} &= \frac{\text{£}5 \ 2s. \ 3\frac{5}{8}d. \times 1 \text{ dr.}}{2s. \ 6d.} \\
 &= \frac{9821 \times 1}{30 \times 8} \text{ drs.} = 5 \text{ oz. } 0 \text{ drs. } 2 \text{ scr. } 15\frac{1}{4} \text{ grs.}
 \end{aligned}$$

$$\begin{aligned}
 \text{Selling price of whole} &= 3 \text{ lbs. } 4 \text{ oz. } 5 \text{ drs. } @ \ 2s. \ 6d. \ \text{per dr., or} \\
 325 \text{ drs.} \times \frac{1}{4} &= \text{£}40 \ 12s. \ 6d.
 \end{aligned}$$

$$\therefore \text{entire gain} = \text{£}40 \ 12s. \ 6d. - \text{£}25 \ 17s. \ 11\frac{5}{8}d. = \text{£}14 \ 14s. \ 6\frac{3}{8}d.$$

$$\begin{aligned}
 \text{Gain per cent.} &= \frac{100 \times \text{£}14 \ 14s. \ 6\frac{3}{8}d.}{\text{£}25 \ 17s. \ 11\frac{5}{8}d.} = \frac{100 \times 28275}{49725} = \frac{2900}{51} \\
 &= 56\frac{44}{51}\%.
 \end{aligned}$$

(15)

	£		£
1s. 8d.	$\frac{1}{12}$	15326 @ 1s. 9 $\frac{1}{2}$ d. in £1.	$\frac{1}{24}$ 15326 @ 2 $\frac{1}{2}$ d. in the £.
1d.	$\frac{1}{20}$	1277 3 4	159 12 11
$\frac{1}{2}$ d.	$\frac{1}{4}$	63 17 2	£159 12s. 11d.
$\frac{1}{4}$ d.	$\frac{1}{8}$	31 18 7	
		15 19 3 $\frac{1}{2}$	
		£1388 18s. 4 $\frac{1}{2}$ d.	

	£		£ s.
6d.	$\frac{1}{40}$	15326 @ 7 $\frac{1}{2}$ d. in the £.	$\frac{1}{10}$ 63 10 @ 2s. 7 $\frac{1}{2}$ d. in the £.
1d.	$\frac{1}{8}$	383 3	6 7
$\frac{1}{2}$ d.	$\frac{1}{4}$	63 17 2	1 11 9
		15 19 3 $\frac{1}{2}$	7 11 $\frac{1}{2}$
		£462 19s. 5 $\frac{1}{2}$ d.	£8 6s. 8 $\frac{1}{2}$ d.

- 6) Cost of seed (planting included) = 2s. 7d. \times 40 bus. = £5 3s. 4d.
 Selling price of potatoes = 2s. 8 $\frac{1}{2}$ d. \times 400 bus. = £53 15s.

1R. 17P. @ £6 10s. per acre.

1A. 1R. 17P. @ £1 16s. per acre.

	£	s.	d.
1R.	$\frac{1}{4}$	6	10 0
10P.	$\frac{1}{4}$	1	12 6
5P.	$\frac{1}{2}$	8	1 $\frac{1}{2}$
2P.	$\frac{1}{5}$	4	0 $\frac{1}{2}$
		1	7 $\frac{1}{2}$

£8 16s. 3 $\frac{1}{2}$ d. rent.

	£	s.	d.
1R.	$\frac{1}{4}$	1	16 0
10P.	$\frac{1}{4}$		9 0
5P.	$\frac{1}{2}$	2	3
2P.	$\frac{1}{5}$	1	1 $\frac{1}{2}$
			5 $\frac{1}{2}$

£2 8s. 9 $\frac{9}{10}$ d. cost of manure.

Cost of digging = 1A. 1R. 17P., or 217P. \times 3 $\frac{1}{2}$ d. = $\frac{1519}{2}$ d. = £3 3s. 3 $\frac{1}{2}$ d.

\therefore total expenses = £5 3s. 4d. + £8 16s. 3 $\frac{1}{2}$ d. + £2 8s. 9 $\frac{9}{10}$ d.

+ £3 3s. 3 $\frac{1}{2}$ d. = £19 11s. 9 $\frac{3}{20}$ d.

\therefore profit = £53 15s. - £19 11s. 9 $\frac{3}{20}$ d. = £34 3s. 2 $\frac{17}{20}$ d.

7)

	£	s.	d.
5s.	$\frac{1}{4}$	1856 11 8 @ 5s. 4 $\frac{1}{2}$ d. in the £.	
4d.	$\frac{1}{15}$	464 2 11	
$\frac{1}{2}$ d.	$\frac{1}{8}$	30 18 10 $\frac{1}{2}$	
		3 17 4 $\frac{7}{24}$	
		£498 19s. 1 $\frac{5}{8}$ d.	

\therefore loss = £1856 11s. 8d. - £498 19s. 1 $\frac{5}{8}$ d. = £1357 12s. 6 $\frac{3}{8}$ d.

(18) 17 barls. 27 gals. 3 qts. 1 pt. @ £1 11s. 6d. per barrel.

		£	s.	d.
18 gals.	$\frac{1}{2}$	1	11	6
				17
		26	15	6
9 gals.	$\frac{1}{2}$		15	9
2 qts.	$\frac{1}{4}$		7	10½
1 qt.	$\frac{1}{2}$			5½
1 pt.	$\frac{1}{2}$			2½
				1½
		£27 19s. 10½d.		

		£	s.	d.
(19) 108 gallons of sherry @ 14s. 6d. per gal.	=	78	6	0
108 " " @ 12s. 6d. "	=	67	10	0
20 " brandy @ 21s. 6d. "	=	21	10	0
236 gallons.		£167	6	0 cost price

Selling price = (236 gals. ÷ 2) × 36s. = £212 8s.

∴ gain = 212 8s. - £167 6s. = £45 2s.

Selling price per doz. to gain £51 = (£167 6s. + £51) ÷ 118 d
= £1 17s.

(20) Pure gold = (12 × £3 17s. 10½d.) ÷ 11 = £4 4s. 11½d.

3 lbs. 8 oz. 6 dwts. 16 grs. @ £4 4s. 11½d. per oz.

		£	s.	d.
5 dwts.	$\frac{1}{4}$	4	4	11½
				4
		16	9	9½
				11
		186	18	0
1 dwt.	$\frac{1}{8}$	1	1	2½
12 grs.	$\frac{1}{2}$		4	2½
4 grs.	$\frac{1}{8}$		2	1½
				8½
		£188 6s. 3½d.		

(21)

15 cwt. 3 qrs. 18 lbs.	
@ £2 7s. 6d. per cwt.	
2 qrs.	$\frac{1}{2}$
	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 2 \quad 7 \quad 6 \\ \hline 3 \\ \hline 7 \quad 2 \quad 6 \\ \hline 5 \\ \hline 35 \quad 12 \quad 6 \\ 1 \text{ qr.} \quad \frac{1}{2} \quad 1 \quad 3 \quad 9 \\ 14 \text{ lbs.} \quad \frac{1}{2} \quad 11 \quad 10\frac{1}{2} \\ 4 \text{ lbs.} \quad \frac{1}{4} \quad 6 \quad 11\frac{1}{4} \\ \hline 1 \quad 8\frac{5}{14} \end{array}$

12 cwt. 2 qrs. 11 lbs.	
@ £4 13s. 4d. per cwt.	
2 qrs.	$\frac{1}{2}$
	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 4 \quad 13 \quad 4 \\ \hline 12 \\ \hline 56 \quad 0 \quad 0 \\ 7 \text{ lbs.} \quad \frac{1}{8} \quad 2 \quad 6 \quad 8 \\ 4 \text{ lbs.} \quad \frac{1}{4} \quad 5 \quad 10 \\ \hline 3 \quad 4 \end{array}$
£58 15s. 10d. butter.	

£37 15s. 9 $\frac{3}{8}$ d. sugar.

2 cwt. 3 qrs. 20 lbs. @ £1 12s. 6d. per cwt.

2 qrs.	$\frac{1}{2}$
	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 1 \quad 12 \quad 6 \\ \hline 2 \\ \hline 3 \quad 5 \quad 0 \\ 1 \text{ qr.} \quad \frac{1}{2} \quad 16 \quad 3 \\ 14 \text{ lbs.} \quad \frac{1}{2} \quad 8 \quad 1\frac{1}{2} \\ 4 \text{ lbs.} \quad \frac{1}{4} \quad 4 \quad 0\frac{1}{4} \\ 2 \text{ lbs.} \quad \frac{1}{8} \quad 1 \quad 1\frac{1}{4} \\ \hline 6\frac{27}{28} \end{array}$

£4 15s. 2 $\frac{1}{4}$ d. raisins.

∴ entire cost = £37 15s. 9 $\frac{3}{8}$ d. + £58 15s. 10d. + £4 15s. 2 $\frac{1}{4}$ d.
= £101 6s. 9 $\frac{1}{4}$ d.

(22)

57A. 3R. 25F.	
228 qrs. 7 bus. 1 pk. 0 gal. 1 qt. 0 $\frac{1}{4}$ pt.	
3 qrs. 7 bus. 2 pks. 1 gal. per acre.	
@ £2 7s. 6d. per qr.	
2R.	$\frac{1}{2}$
	$\begin{array}{r} \text{qrs. bus. pks. gals.} \\ 3 \quad 7 \quad 2 \quad 1 \\ \hline 57 \\ \hline 225 \quad 2 \quad 2 \quad 1 \text{ qts.} \\ 1 \text{ R.} \quad \frac{1}{2} \quad 1 \quad 7 \quad 3 \quad 0 \quad 2 \\ 20\text{F.} \quad \frac{1}{2} \quad 7 \quad 3 \quad 1 \quad 1 \text{ pts.} \\ 5\text{P.} \quad \frac{1}{4} \quad 3 \quad 3 \quad 1 \quad 2 \quad 1 \\ \hline 3 \quad 1 \quad 3 \quad 1\frac{1}{4} \\ \hline 228 \quad 7 \quad 1 \quad 0 \quad 1 \quad 0\frac{1}{4} \end{array}$
4 bus.	$\frac{1}{2}$
	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 2 \quad 7 \quad 6 \\ \hline 228 \\ \hline 541 \quad 10 \quad 0 \\ 2 \text{ bus.} \quad \frac{1}{2} \quad 1 \quad 3 \quad 9 \\ 1 \text{ bus.} \quad \frac{1}{2} \quad 11 \quad 10\frac{1}{2} \\ 1 \text{ pk.} \quad \frac{1}{4} \quad 5 \quad 11\frac{1}{4} \\ 1 \text{ qt.} \quad \frac{1}{8} \quad 1 \quad 5\frac{13}{16} \\ \hline 2\frac{29}{128} \\ \hline 0\frac{255}{1024} \end{array}$
£543 13s. 3 $\frac{59}{1024}$	

57A. 3R. 25P.

26 qrs. 1 bus. 3 pks. 1 gal. 1 qt. 0½ pt.

@ 3 bus. 2 pks. 1 gal. per acre.

@ £1 3s. 6d. per qr.

		qrs.	bus.	pks.	gals.			£	s.	d.
2R.	½	3	2	1		1 bus.	⅛	1	3	6
				57						26
		25	6	2	1 qts.			30	11	0
1R.	½		1	3	0 2	2 pks.	½		2	11½
20P.	½			3	1 1 pta.	1 pk.	½		1	6½
5P.	¼			1	1 2 1	1 gal.	½			8½
					3 1½	1 qt.	¼			4½
		26	1	3	1 1 0½	½ pt.	⅛			1½
										0½
										1024
								£30	16s.	7½

∴ the value of whole = £543 13s. 3½d. + £30 16s. 7½d.
= £574 9s. 10½d.

(23)

cwt.	qrs.	lbs.			£	s.	d.
3	1	3	1 qr.	¼	1	12	8
		1 19					14
2	3	12			22	17	4
		5	4 lbs.	⅓		8	2
14	1	4 sugar.				1	2
					£23	6s.	8d. cost.

@ £1 12s. 8d per cwt.

Selling price = 14 cwt. 1 qr. 4 lbs., or 1600 lbs. × 9d. = £30.

Gain = £30 - £23 6s. 8d. = £6 13s. 4d.

(24)

	lbs.	
5s.	¼	48764538 @ 5s. 9½d. per lb.
6d.	⅓	12191134 10
3d.	½	1219113 9
¾d.	¼	609556 14 6
		152389 3 7½
		£14172193 17s. 1½d.

EXERCISE LIV., p. 98.

I=interest, P=principal, M=amount, T=time, R=rate.

$$(1)*\text{Interest} = \frac{300 \times 4 \times 5}{100} l. = £60.$$

$$\text{Amount} = £300 + £60 = £360.$$

$$(2) \text{Interest} = \frac{700 \times 3 \times 4}{100} l. = £84.$$

$$\text{Amount} = £700 + £84 = £784.$$

$$(3) \text{Interest} = \frac{420 \times 3 \times 7}{100 \times 2} l. = £\frac{441}{10} = £44 \text{ 2s.}$$

$$\text{Amount} = £420 + £44 \text{ 2s.} = £464 \text{ 2s.}$$

$$(4) \text{Interest} = \frac{640 \times 9 \times 17}{100 \times 4} l. = £\frac{1225}{5} = £244 \text{ 16s.}$$

$$\text{Amount} = £640 + £244 \text{ 16s.} = £884 \text{ 16s.}$$

$$(5) \text{Interest} = \frac{1256 \times 7 \times 7}{100 \times 2} l. = £\frac{7693}{25} = £307 \text{ 14s. } 4\frac{4}{5}d.$$

$$\text{Amount} = £1256 + £307 \text{ 14s. } 4\frac{4}{5}d. = £1563 \text{ 14s. } 4\frac{4}{5}d.$$

$$(6) \text{Interest} = \frac{1845 \times 6\frac{1}{2} \times 4\frac{1}{2}}{100} l. = \frac{1845 \times 13 \times 17}{100 \times 2 \times 4} l. = £\frac{85962}{160}$$

$$= £509 \text{ 13s. } 7\frac{1}{2}d.$$

$$\text{Amount} = £1845 + £509 \text{ 13s. } 7\frac{1}{2}d. = £2354 \text{ 13s. } 7\frac{1}{2}d.$$

$$(7) \text{Interest} = \frac{1420\frac{21}{40} \times 4 \times 5}{100} l. = \frac{56821 \times 4 \times 5}{40 \times 100} l. = £\frac{56821}{200} = £284 \text{ 2s. } 1\frac{1}{2}d.$$

$$\text{Amount} = £1420 \text{ 10s. } 6d. + £284 \text{ 2s. } 1\frac{1}{2}d. = £1704 \text{ 12s. } 7\frac{1}{2}d.$$

$$(8) \text{Interest} = \frac{291\frac{3}{8} \times 6 \times 3\frac{1}{2}}{100} l. = \frac{875 \times 6 \times 5}{100 \times 3 \times 4} l. = £\frac{525}{8} = £65 \text{ 12s. } 6d.$$

$$\text{Amount} = £291 \text{ 13s. } 4d. + £65 \text{ 12s. } 6d. = £357 \text{ 5s. } 10d.$$

$$(9) \text{Interest} = \frac{588\frac{1}{2} \times 5 \times 3\frac{1}{2}}{100} l. = \frac{1765 \times 13 \times 15}{100 \times 3 \times 4} l. = £\frac{4599}{48} = £95 \text{ 12s. } 1d.$$

$$\text{Amount} = £588 \text{ 6s. } 8d. + £95 \text{ 12s. } 1d. = £683 \text{ 18s. } 9d.$$

$$(10) \text{Interest} = \frac{1050\frac{5}{8} \times 5\frac{1}{2} \times 4\frac{1}{2}}{100} l. = \frac{8405 \times 11 \times 17}{100 \times 8 \times 2 \times 4} l. = £\frac{314247}{1280}$$

$$= £245 \text{ 11s. } 8\frac{1}{16}d.$$

$$\text{Amount} = £1050 \text{ 12s. } 6d. + £245 \text{ 11s. } 8\frac{1}{16}d. = £1296 \text{ 4s. } 2\frac{1}{16}d.$$

* Interest = (principal \times rate \times time) \div 100.

$$(11) \text{ Interest} = \frac{3217 \times 7 \times 4\frac{1}{2}}{100} l. = \frac{1937 \times 7 \times 9}{100 \times 60 \times 2} l. = \frac{\pounds 40877}{4000} = \pounds 10 \text{ 3s. } 4\frac{31}{80} d.$$

$$\text{Amount} = \pounds 32 \text{ 6s. } 8 d. + \pounds 10 \text{ 3s. } 4\frac{31}{80} d. = \pounds 42 \text{ 9s. } 0\frac{31}{80} d.$$

$$(12) \text{ Interest} = \frac{691\frac{1}{2} \times 5\frac{1}{2} \times 3\frac{1}{2}}{100} l. = \frac{3456 \times 23 \times 15}{100 \times 5 \times 4 \times 4} l. = \frac{\pounds 2796}{25} = \pounds 149 \text{ 0s. } 9\frac{3}{5} d.$$

$$\text{Amount} = \pounds 691 \text{ 4s. } + \pounds 149 \text{ 0s. } 9\frac{3}{5} d. = \pounds 840 \text{ 4s. } 9\frac{3}{5} d.$$

$$(13) \text{ Interest} = \frac{367\frac{1}{2} \times 4\frac{1}{2} \times 3\frac{1}{2}}{100} l. = \frac{735 \times 9 \times 15}{100 \times 2 \times 2 \times 4} l. = \frac{\pounds 3969}{84} = \pounds 62 \text{ 0s. } 3\frac{1}{4} d.$$

$$\text{Amount} = \pounds 367 \text{ 10s. } + \pounds 62 \text{ 0s. } 3\frac{1}{4} d. = \pounds 429 \text{ 10s. } 3\frac{1}{4} d.$$

$$(14) \text{ Interest} = \frac{737\frac{5}{8} \times \frac{3}{4} \times 4\frac{1}{2}}{100} l. = \frac{5901 \times 3 \times 9}{100 \times 8 \times 4 \times 2} l. = \frac{\pounds 159327}{6400}$$

$$= \pounds 24 \text{ 17s. } 10\frac{61}{80} d.$$

$$\text{Amount} = \pounds 737 \text{ 12s. } 6 d. + \pounds 24 \text{ 17s. } 10\frac{61}{80} d. = \pounds 762 \text{ 10s. } 4\frac{61}{80} d.$$

$$(15) \text{ Interest} = \frac{219 \times \frac{117}{355} \times 4\frac{1}{2}}{100} l. = \frac{219 \times 117 \times 19}{100 \times 365 \times 4} l. = \frac{\pounds 9699}{4000} = \pounds 3 \text{ 6s. } 8\frac{7}{35} d.$$

$$\text{Amount} = \pounds 219 + \pounds 3 \text{ 6s. } 8\frac{7}{35} d. = \pounds 222 \text{ 6s. } 8\frac{7}{35} d.$$

$$(16) \text{ Interest} = \frac{346\frac{1}{2} \times 3\frac{4}{5} \times 4\frac{1}{2}}{100} l. = \frac{1387 \times 262 \times 9}{100 \times 4 \times 73 \times 2} l. = \frac{\pounds 22401}{400}$$

$$= \pounds 56 \text{ 0s. } 0\frac{3}{5} d.$$

$$\text{Amount} = \pounds 346 \text{ 15s. } + \pounds 56 \text{ 0s. } 0\frac{3}{5} d. = \pounds 402 \text{ 15s. } 0\frac{3}{5} d.$$

$$(17) 8 \text{ mo.} = \frac{2}{3} \text{ yr.}; 25 \text{ dys.} = \frac{25}{365} = \frac{5}{73} \text{ yr.}$$

$$\therefore 2 + \frac{2}{3} + \frac{5}{73} = 2 \frac{146 + 15}{219} = 2\frac{161}{219} \text{ yrs.}$$

$$\text{Interest} = \frac{150\frac{1}{2} \times 2\frac{161}{219} \times 5}{100} l. = \frac{301 \times 599 \times 5}{100 \times 2 \times 219} l. = \frac{\pounds 190299}{8780}$$

$$= \pounds 20 \text{ 11s. } 7\frac{51}{73} d.$$

$$\text{Amount} = \pounds 150 \text{ 10s. } + \pounds 20 \text{ 11s. } 7\frac{51}{73} d. = \pounds 171 \text{ 1s. } 7\frac{51}{73} d.$$

$$(18) 9 \text{ mo.} = \frac{3}{4} \text{ yr.}; 40 \text{ dys.} = \frac{40}{365} = \frac{8}{73} \text{ yr.}$$

$$\therefore 5 + \frac{3}{4} + \frac{8}{73} = 5 \frac{219 + 32}{292} = 5\frac{251}{292} \text{ yrs.}$$

$$\text{Interest} = \frac{3114\frac{2}{3} \times 5\frac{251}{292} \times 3\frac{1}{2}}{100} l. = \frac{9344 \times 1711 \times 7}{100 \times 3 \times 292 \times 2} l. = \frac{\pounds 47808}{75}$$

$$= \pounds 638 \text{ 15s. } 5\frac{3}{5} d.$$

$$\text{Amount} = \pounds 3114 \text{ 13s. } 4 d. + \pounds 638 \text{ 15s. } 5\frac{3}{5} d. = \pounds 3753 \text{ 8s. } 9\frac{3}{5} d.$$

- (19) 6 mo. =
- $\frac{1}{2}$
- yr.; 73 dys. =
- $\frac{73}{365}$
- =
- $\frac{1}{5}$
- yr.

$$\therefore 3 + \frac{1}{2} + \frac{1}{5} = 3\frac{7}{10} \text{ yrs.}$$

$$\text{Interest} = \frac{2133\frac{1}{2} \times 3\frac{7}{10} \times 4\frac{1}{2}}{100} l. = \frac{6400 \times 17 \times 37}{100 \times 3 \times 10 \times 4} l. = \pounds 202\frac{2}{15}$$

$$= \pounds 335s. 9s. 4d.$$

$$\text{Amount} = \pounds 2133 \text{ 6s. 8d.} + \pounds 335 \text{ 9s. 4d.} = \pounds 2468 \text{ 16s.}$$

- (20) 4 mo. =
- $\frac{1}{3}$
- yr.; 145 dys. =
- $\frac{145}{365}$
- =
- $\frac{29}{73}$
- yr.

$$\therefore 6 + \frac{1}{3} + \frac{29}{73} = 6\frac{160}{1119} \text{ yrs.}$$

$$\text{Interest} = \frac{1450\frac{1}{2} \times 6\frac{160}{1119} \times 5}{100} l. = \frac{11607 \times 1474 \times 5}{100 \times 8 \times 219} l. = \pounds 290\frac{1}{60}$$

$$= \pounds 488 \text{ 5s. 3d.}$$

$$\text{Amount} = \pounds 1450 \text{ 17s. 6d.} + \pounds 488 \text{ 5s. 3d.} = \pounds 1939 \text{ 2s. 9d.}$$

EXERCISE LV., p. 99.

- (1) From January 10th to November 3rd = 297 days.

$$\text{Interest} = \frac{300 \times 9 \times 297}{100 \times 2 \times 365} l. = \pounds 90\frac{19}{365} = \pounds 10 \text{ 19s. } 8\frac{28}{73}d.$$

- (2) From May 15th to November 7th = 176 days.

$$\text{Interest} = \frac{243\frac{1}{2} \times \frac{176}{365} \times 3\frac{1}{2}}{100} l. = \frac{730 \times 15 \times 176}{100 \times 3 \times 365 \times 4} l. = \pounds 22\frac{2}{5} = \pounds 4 \text{ 8s.}$$

- (3) From March 1st, 1840, to June 11th, 1842, =
- $2\frac{102}{365}$
- yrs.

$$\text{Interest} = \frac{1231\frac{1}{2} \times 3\frac{1}{4} \times 2\frac{102}{365}}{100} l. = \frac{9855 \times 13 \times 832}{100 \times 8 \times 4 \times 365} l. = \pounds 48\frac{563}{60}$$

$$= \pounds 91 \text{ 5s. } 2\frac{2}{5}d.$$

$$\text{Amount} = \pounds 1231 \text{ 17s. 6d.} + \pounds 91 \text{ 5s. } 2\frac{2}{5}d. = \pounds 1323 \text{ 2s. } 8\frac{2}{5}d.$$

- (4)
- $\frac{535 \times 15 \times N}{100 \times 4} = \frac{321}{4}$
- $\therefore N = \frac{321}{4} \times \frac{100 \times 4}{535 \times 15} = 4$
- yrs.

- (5) From July 1st, 1859, to June 26th, 1861, =
- $1\frac{72}{73}$
- yrs.

$$\text{Interest} = \frac{1703\frac{1}{2} \times 1\frac{72}{73} \times 4\frac{1}{2}}{100} l. = \frac{5110 \times 145 \times 9}{100 \times 3 \times 73 \times 2} l. = \pounds 52\frac{2}{4} = \pounds 152 \text{ 5s.}$$

$$\text{Amount} = \pounds 1703 \text{ 6s. 8d.} + \pounds 152 \text{ 5s.} = \pounds 1855 \text{ 11s. 8d.}$$

- (6)
- $P = \pounds 537\frac{1}{2}$
- or
- $\pounds 3227$
- ;
- $1 = \pounds 53\frac{17}{60}$
- =
- $\pounds 3227$
- .

$$\frac{3227 \times 4 \times R}{100 \times 6} = \frac{3227}{60} \therefore R = \frac{3227}{60} \times \frac{100 \times 6}{3227 \times 4} = \frac{5}{2} = 2\frac{1}{2} \text{ per cent.}$$

- (7) Interest = £387 7s. 7½d. - £345 17s. 6d. = £41 10s. 1½d., or $\frac{4806}{240 \times 5} l.$

$$\frac{345\frac{7}{8} \times 4 \times T}{100} = \frac{49806}{240 \times 5} \therefore T = \frac{42806}{240 \times 5} \times \frac{100 \times 8}{2767 \times 4} = 3 \text{ years.}$$
- (8) $\frac{P \times 9\frac{3}{4} \times 5}{100} = \frac{218}{1} \therefore P = \frac{218}{1} \times \frac{100 \times 73}{720 \times 5} = \frac{7519}{8} = £1253 \text{ 3s. 4d.}$
- (9) Interest = £1884 18s. 11d. - £1303 6s. 8d. = £581 12s. 3d., or $\frac{46539}{80} l.$

$$\frac{1303\frac{1}{4} \times 7 \times R}{100} = \frac{46539}{80} \therefore R = \frac{46539}{80} \times \frac{100 \times 3}{3910 \times 7} = \frac{51}{8} = 6\frac{3}{8} \text{ per cent.}$$
- (10) Interest = £602 13s. 4½d. - £527 10s. = £75 3s. 4½d., or $\frac{35081}{480} l.$

$$\frac{527\frac{1}{2} \times 3\frac{1}{2} \times N}{100} = \frac{35081}{480} \therefore N = \frac{35081}{480} \times \frac{100 \times 2 \times 4}{1055 \times 15} = \frac{19}{5} = 3\frac{4}{5} \text{ years.}$$
- (11) Interest = £519 1s. 1½d. - £446 10s. = £72 11s. 1½d., or $\frac{34827}{480} l.$

$$\frac{446\frac{1}{2} \times 5 \times N}{100} = \frac{34827}{480} \therefore N = \frac{34827}{480} \times \frac{100 \times 2}{893 \times 5} = \frac{19}{4} = 4\frac{3}{4} \text{ years.}$$
- (12) Interest = £734 8s. - £540 = £194 8s., or $\frac{272}{5} l.$

$$\frac{540 \times R \times 9}{100} = \frac{272}{5} \therefore R = \frac{272}{5} \times \frac{100}{540 \times 9} = 4 \text{ per cent.}$$
- (13) Interest = £77 2s. 11½d., or $\frac{74061}{980} l.$

$$\frac{P \times 4\frac{1}{2} \times 3\frac{1}{4}}{100} = \frac{74061}{980} \therefore P = \frac{74061}{980} \times \frac{100 \times 2 \times 4}{9 \times 13} = \frac{1055}{2} = £527 \text{ 10s.}$$
- (14) Interest = £1165 10s. 5d. - £1043 15s. = £121 15s. 5d., or $\frac{5845}{48} l.$

$$\frac{1043\frac{3}{4} \times 5\frac{3}{4} \times N}{100} = \frac{5845}{48} \therefore N = \frac{5845}{48} \times \frac{100 \times 4 \times 5}{4175 \times 28} = \frac{35}{12} = 2\frac{1}{12} \text{ years.}$$
- (15)* $P + \frac{P \times 5 \times 9}{100 \times 2 \times 2} = \frac{1691}{2}$, or $1\frac{9}{80}P = \frac{1691}{2} \therefore P = \frac{1691}{2} \times \frac{80}{9} = £760.$
- (16) $\frac{1825 \times 7 \times N}{100 \times 2} = \frac{56}{5} \therefore N = \frac{56}{5} \times \frac{100 \times 2}{1825 \times 7} = \frac{64}{385} \text{ yrs.} = 64 \text{ days.}$
- (17) Interest = £1416 14s. 4d. - £1391 13s. 4d. = £25 1s., or $\frac{501}{20} l.$

$$\frac{1391\frac{1}{2} \times 146 \times R}{100 \times 365} = \frac{501}{20} \therefore R = \frac{501}{20} \times \frac{100 \times 365 \times 3}{4175 \times 146} = \frac{9}{2} = 4\frac{1}{2} \text{ per cent.}$$
- (18) Interest = £2167 18s. - £2128 = £39 18s., or $\frac{399}{10} l.$

$$\frac{2128 \times 15 \times N}{100 \times 4} = \frac{399}{10} \therefore N = \frac{399}{10} \times \frac{100 \times 4}{2128 \times 15} = \frac{1}{2} \text{ yr.} = 6 \text{ months.}$$

$$\text{* Principal} + \frac{\text{principal} \times \text{rate} \times \text{time}}{100} = \text{amount.}$$

$$9) \text{ Interest} = £3549 \text{ 3s. 9d.} - £3292 = £257 \text{ 3s. 9d., or } £\frac{20575}{80}.$$

$$\frac{3292 \times 5 \times R}{100 \times 2} = \frac{20575}{80} \therefore R = \frac{20575}{80} \times \frac{100 \times 2}{3292 \times 5} = \frac{25}{8} = 3\frac{1}{8} \text{ per cent.}$$

$$10) \text{ Amount} = £1834 \text{ 10s. 9d., or } £\frac{146763}{80}.$$

$$P + \frac{P \times \frac{7}{100} \times \frac{25}{4}}{\frac{7}{100} \times \frac{7}{100} \times 2} = \frac{146763}{80} \therefore P = \frac{146763}{80} \times \frac{8}{9} = £\frac{16207}{10} = £1630 \text{ 14s.}$$

$$11) \text{ Interest} = £20814 \text{ 18s. 8d.} - £18922 \text{ 13s. 4d.} = £892 \text{ 5s. 4d., or } £\frac{28384}{15}.$$

$$\frac{18922\frac{2}{3} \times 10 \times T}{100 \times 3} = \frac{28384}{15} \therefore T = \frac{28384}{15} \times \frac{100 \times 3 \times 3}{56768 \times 10} = 3 \text{ years.}$$

$$12) \text{ Interest} = £13842 - £11535 = £2307.$$

$$\frac{11535 \times 4 \times R}{100} = 2307 \therefore R = \frac{2307}{1} \times \frac{100}{11535 \times 4} = 5 \text{ per cent.}$$

$$13) P + \frac{P \times \frac{7\frac{1}{2}}{100} \times \frac{4}{4}}{\frac{7\frac{1}{2}}{100} \times \frac{4}{4}} = \frac{16416}{1} \therefore P = \frac{16416}{1} \times \frac{7\frac{1}{2}}{7\frac{1}{2}} = £15768.$$

$$14) \text{ Interest} = £6031 \text{ 13s. 4d.} - £5718 \text{ 6s. 8d.} = £313 \text{ 6s. 8d.} = £\frac{240}{3}.$$

$$\frac{5718\frac{1}{2} \times 12\frac{7}{8} \times R}{100} = \frac{240}{3} \therefore R = \frac{240}{3} \times \frac{100 \times 3 \times 73}{17155 \times 100} = 4 \text{ per cent.}$$

$$15) \text{ Interest} = £20334 \text{ 12s.} - £15642 = £4692 \text{ 12s.} = £\frac{23463}{5}.$$

$$\frac{15642 \times 5 \times N}{100} = \frac{23463}{5} \therefore N = \frac{23463}{5} \times \frac{100}{15642 \times 5} = 6 \text{ years.}$$

$$16) \text{ From January 11th to March 16th} = 65 \text{ days.}$$

$$\text{Interest} = \frac{\frac{776355}{240} \times \frac{65}{365} \times 5}{100} \text{ l.} = \frac{776355 \times 65 \times 5}{100 \times 240 \times 365} \text{ l.} = £\frac{9217}{320} \\ = £28 \text{ 16s. } 0\frac{3}{4}\text{d.}$$

$$17) \text{ Interest} = £4792 \text{ 4s.} - £4471 \text{ 5s.} = £320 \text{ 19s.} = £\frac{6419}{20}.$$

$$\frac{4471\frac{1}{4} \times 2\frac{56}{385} \times R}{100} = \frac{6419}{20} \therefore R = \frac{6419}{20} \times \frac{100 \times 4 \times 365}{17885 \times 786} = \frac{10}{3} = 3\frac{1}{3} \text{ per cent.}$$

$$18) \text{ Interest} = £3285 - £2737 \text{ 10s.} = £547 \text{ 10s.} = £\frac{1095}{2}.$$

$$\frac{2737\frac{1}{2} \times 5 \times R}{100} = \frac{1095}{2} \therefore R = \frac{1095}{2} \times \frac{100 \times 2}{5475 \times 5} = 4 \text{ per cent.}$$

$$(29) 3 + \frac{1}{3} + \frac{21}{365} = 3\frac{428}{1095} \text{ yrs.}$$

$$\text{Interest} = \frac{821\frac{1}{4} \times 3\frac{428}{1095} \times 3\frac{1}{4}}{100} l. = \frac{3285 \times 3713 \times 15}{100 \times 1095 \times 4 \times 4} l. = \frac{23417}{320}$$

$$= £104 \text{ 8s. } 6\frac{1}{4}d.$$

$$(30) M = £43590\frac{5}{8} = £\frac{348725}{8}; 1 \text{ yr. } 10 \text{ dys.} = \frac{75}{8} \text{ yrs.}$$

$$P + \frac{P \times \overset{3}{75} \times \overset{4}{15}}{\underset{4}{100} \times 72 \times 5} = \frac{348725}{8} \therefore P = \frac{348725}{8} \times \frac{365}{377} = £\frac{337625}{8}$$

$$= £42203 \text{ 2s. } 6d.$$

EXERCISE LVI., p. 103.

$$(1) M = £735 \text{ 9s. } 6d. = £\frac{29419}{40}; 10 \text{ mo.} = \frac{5}{6} \text{ yr.}$$

$$P + \frac{P \times \frac{5}{6} \times \frac{1}{6}}{\frac{100}{5} \times 6} = \frac{29419}{40} \therefore P = \frac{29419}{40} \times \frac{30}{31} = £\frac{2847}{4} = £711 \text{ 15s.} = P.W.$$

$$\therefore D = £735 \text{ 9s. } 6d. - £711 \text{ 15s.} = £23 \text{ 14s. } 6d.$$

$$(2) M = £736 \text{ 15s.} = £\frac{2947}{4}; 1 \text{ yr. } 3 \text{ mo.} = 1\frac{1}{4} \text{ or } \frac{5}{4} \text{ yr.}$$

$$P + \frac{P \times \frac{5}{4} \times \frac{1}{4}}{\frac{100}{20} \times \frac{1}{4}} = \frac{2947}{4} \therefore P = \frac{2947}{4} \times \frac{20}{21} = £\frac{2105}{3} = £701 \text{ 13s. } 4d. = P.W.$$

$$\therefore D = £736 \text{ 15s.} - £701 \text{ 13s. } 4d. = £35 \text{ 1s. } 8d.$$

$$(3) M = £864 \text{ 11s. } 8d. = £\frac{10375}{12}; 9 \text{ mo.} = \frac{3}{4} \text{ yr.}$$

$$P + \frac{P \times \frac{3}{4} \times \frac{1}{4}}{\frac{100}{20} \times \frac{1}{4}} = \frac{10375}{12} \therefore P = \frac{10375}{12} \times \frac{80}{83} = £\frac{2500}{3} = £833 \text{ 6s. } 8d. = P.W.$$

$$\therefore D = £864 \text{ 11s. } 8d. - £833 \text{ 6s. } 8d. = £31 \text{ 5s.}$$

$$(4) M = £913 \text{ 17s. } 6d. = £\frac{7311}{8}.$$

$$P + \frac{P \times \frac{1}{2} \times \frac{1}{2}}{\frac{100}{4} \times 2} = \frac{7311}{8} \therefore P = \frac{7311}{8} \times \frac{8}{9} = £\frac{2437}{3} = £812 \text{ 6s. } 8d. = P.W.$$

$$\therefore D = £913 \text{ 17s. } 6d. - £812 \text{ 6s. } 8d. = £101 \text{ 10s. } 10d.$$

$$i) M = £1885 \text{ 16s. 2d.} = £\frac{226227}{150}; 3\frac{3}{4} \text{ yrs.} = \frac{15}{4} \text{ yrs.}$$

$$P + \frac{P \times \frac{15}{4} \times \frac{3}{4}}{100 \times \frac{3}{4}} = \frac{226227}{150} \therefore P = \frac{226227}{150} \times \frac{20}{23} = £\frac{226227}{6} = £1639 \text{ 16s. 8d.}$$

$$20$$

$$= P.W.$$

$$\therefore D = £1885 \text{ 16s. 2d.} - £1639 \text{ 16s. 8d.} = £245 \text{ 19s. 6d.}$$

$$i) M = £15239 \text{ 2s. 11d.} = £\frac{721472}{48}; 1\frac{1}{4} \text{ yr.} = \frac{5}{4} \text{ yr.}$$

$$P + \frac{P \times \frac{5}{4} \times \frac{3}{4}}{100 \times \frac{3}{4}} = \frac{721472}{48} \therefore P = \frac{721472}{48} \times \frac{80}{83} = £\frac{22120}{3} = £14688 \text{ 6s. 8d.}$$

$$20$$

$$= P.W.$$

$$\therefore D = £15239 \text{ 2s. 11d.} - £14688 \text{ 6s. 8d.} = £550 \text{ 16s. 3d.}$$

$$7) M = £9730 \text{ 7s. 4d.} = £\frac{221911}{30}; 1 \text{ yr. 73 dys.} = 1\frac{1}{2} \text{ yr. or } \frac{3}{2} \text{ yr.}$$

$$P + \frac{P \times \frac{3}{2} \times \frac{25}{4}}{100 \times \frac{5}{4} \times \frac{3}{4}} = \frac{221911}{30} \therefore P = \frac{221911}{30} \times \frac{80}{83} = £\frac{22120}{3} = £9378 \text{ 13s. 4d.}$$

$$4 \quad 4$$

$$= P.W.$$

$$\therefore D = £9730 \text{ 7s. 4d.} - £9378 \text{ 13s. 4d.} = £351 \text{ 14s.}$$

$$8) M = £3879 \text{ 8s.} = £\frac{19327}{5}; 2 \text{ yrs. 20 dys.} = 2\frac{4}{73} \text{ or } \frac{150}{73} \text{ yrs.; } 3\frac{1}{4} \text{ p.c.} = \frac{73}{24}.$$

$$P + \frac{P \times \frac{150}{73} \times \frac{73}{24}}{100 \times \frac{73}{24} \times \frac{24}{4}} = \frac{19327}{5} \therefore P = \frac{19327}{5} \times \frac{16}{17} = £\frac{18256}{5} = £3651 \text{ 4s.}$$

$$2 \quad 8$$

$$= P.W.$$

$$\therefore D = £3879 \text{ 8s.} - £3651 \text{ 4s.} = £228 \text{ 4s.}$$

$$(9) M = £6670 \text{ 6s.} = £\frac{66703}{10}; 1 \text{ yr. 135 dys.} = \frac{127}{73} \text{ or } \frac{100}{73} \text{ yrs.; } 3\frac{1}{2} \text{ p.c.} = \frac{73}{20}.$$

$$P + \frac{P \times \frac{100}{73} \times \frac{73}{20}}{100 \times \frac{73}{20} \times 20} = \frac{66703}{10} \therefore P = \frac{66703}{10} \times \frac{20}{21} = £\frac{12958}{3} = £6352 \text{ 13s. 4d.}$$

$$= P.W.$$

$$\therefore D = £6670 \text{ 6s.} - £6352 \text{ 13s. 4d.} = £317 \text{ 12s. 8d.}$$

$$(10) M = £9974 \text{ 5s. 1d.} = \frac{3383821}{240}; 1 \text{ yr. 8 mo.} = 1\frac{2}{3} \text{ or } \frac{5}{3} \text{ yr.}; 3\frac{1}{2} \text{ p.c.} = \frac{7}{4}.$$

$$P + \frac{P \times 5 \times \frac{7}{4}}{100 \times 3 \times 4} = \frac{3383821}{240} \therefore P = \frac{3383821}{240} \times \frac{16}{17} = \frac{£140813}{15}$$

$$= £9387 \text{ 10s. 8d.} = P.W.$$

$$\therefore D = £9974 \text{ 5s. 1d.} - £9387 \text{ 10s. 8d.} = £586 \text{ 14s. 5d.}$$

$$(11) M = £204 \text{ 1s. 11d.} = \frac{48983}{240}; 4 \text{ mo.} = \frac{1}{3} \text{ yr.}$$

$$P + \frac{P \times 1 \times \frac{1}{3}}{100 \times 3} = \frac{48983}{240} \therefore P = \frac{48983}{240} \times \frac{80}{81} = \frac{£803}{4} = £200 \text{ 15s.} = P.W.$$

$$\therefore D = £204 \text{ 1s. 11d.} - £200 \text{ 15s.} = £3 \text{ 6s. 11d.}$$

$$(12) M = £351 \text{ 11s. 10d.} = \frac{£42191}{120}; 1 \text{ yr. 35 dys.} = 1\frac{7}{12} \text{ or } \frac{89}{12} \text{ yr.}; 3\frac{1}{4} \text{ p.c.} = \frac{73}{24}$$

$$P + \frac{P \times 89 \times \frac{73}{24}}{100 \times 73 \times \frac{24}{3}} \times \frac{42191}{120} \therefore P = \frac{42191}{120} \times \frac{30}{81} = \frac{£1361}{4} = £340 \text{ 5s.} = P.W.$$

$$\therefore D = £351 \text{ 11s. 10d.} - £340 \text{ 5s.} = £11 \text{ 6s. 10d.}$$

$$(13) M = £615 \text{ 11s. 9d.} = \frac{£49247}{80}; 3 \text{ mo.} = \frac{1}{4} \text{ yr.}; 3\frac{1}{3} \text{ p.c.} = \frac{10}{3}.$$

$$P + \frac{P \times 1 \times \frac{10}{3}}{100 \times 4 \times 3} = \frac{49247}{80} \therefore P = \frac{49247}{80} \times \frac{120}{121} = \frac{£1221}{2} = £610 \text{ 10s.} = P.W.$$

$$\therefore D = £615 \text{ 11s. 9d.} - £610 \text{ 10s.} = £5 \text{ 1s. 9d.}$$

$$(14) M = £673 \text{ 5s. 1d.} = \frac{£161581}{240}; 250 \text{ dys.} = \frac{50}{73} \text{ yr.}; 3\frac{1}{2} \text{ p.c.} = \frac{73}{20}.$$

$$P + \frac{P \times 50 \times \frac{73}{20}}{100 \times 20 \times \frac{73}{2}} = \frac{161581}{240} \therefore P = \frac{161581}{240} \times \frac{40}{41} = \frac{£3241}{8} = £656 \text{ 16s. 8d.}$$

$$= P.W.$$

$$\therefore D = £673 \text{ 5s. 1d.} - £656 \text{ 16s. 8d.} = £16 \text{ 8s. 5d.}$$

$$(15) M = £145071 \text{ 8s. 9d.} = \frac{£2321143}{18}; 125 \text{ dys.} = \frac{25}{73} \text{ yr.}; 2\frac{1}{2} \text{ p.c.} = \frac{73}{20}.$$

$$P + \frac{P \times 25 \times \frac{73}{20}}{100 \times 73 \times 30} = \frac{2321143}{18} \therefore P = \frac{2321143}{18} \times \frac{120}{121} = \frac{£287745}{2}$$

$$= £143872 \text{ 10s.} = P.W.$$

$$\therefore D = £145071 \text{ 8s. 9d.} - £143872 \text{ 10s.} = £1198 \text{ 18s. 9d.}$$

- (16) From April 14th to May 9th (including 3 days' grace) = 25 dys.
or $\frac{5}{73}$ yr.; $M = £73\frac{1}{2} = £268$.

$$P + \frac{P \times 5 \times \frac{1}{2}}{100 \times 73} = \frac{268}{5} \therefore P = \frac{268}{5} \times \frac{365}{368} = £73 = P.W.$$

$$\therefore D = £73 \text{ 4s.} - £73 = 4s.$$

- (17) From September 23rd to October 23rd (including 3 days' grace)
= 30 dys. or $\frac{6}{73}$ yr.; $M = £146 \text{ 12s.} = £133$.

$$P + \frac{P \times 6 \times \frac{1}{2}}{100 \times 73} = \frac{133}{5} \therefore P = \frac{133}{5} \times \frac{730}{733} = £146 = P.W.$$

$$\therefore D = £146 \text{ 12s.} - £146 = 12s.$$

- (18) From August 1st to October 13th (including 3 days' grace) = 73 dys.
or $\frac{1}{2}$ yr.; $M = £176\frac{1}{2} = £174$.

$$P + \frac{P \times 1 \times \frac{1}{2}}{100 \times 73} = \frac{174}{4} \therefore P = \frac{174}{4} \times \frac{100}{101} = £175 = P.W.$$

$$\therefore D = £176 \text{ 15s.} - £175 = £1 \text{ 15s.}$$

- (19) From September 11th to October 26th (including 3 days' grace)
= 45 dys. or $\frac{9}{73}$ yr.; $M = £1099\frac{1}{2} = £1199$.

$$P + \frac{P \times 9 \times \frac{1}{2}}{100 \times 73} = \frac{1199}{3} \therefore P = \frac{1199}{3} \times \frac{730}{733} = £1095 = P.W.$$

$$\therefore D = £1099 \text{ 10s.} - £1095 = £4 \text{ 10s.}$$

- (20) From May 13th to June 7th (including 3 days' grace) = 25 dys.
or $\frac{5}{73}$ yr.; $M = £292\frac{1}{2} = £146$.

$$P + \frac{P \times 5 \times \frac{1}{2}}{100 \times 73} = \frac{146}{5} \therefore P = \frac{146}{5} \times \frac{365}{368} = £292 = P.W.$$

$$\therefore D = £292 \text{ 16s.} - £292 = 16s.$$

- (21) From October 27th to December 6th (including 3 days' grace)
= 40 days or $\frac{8}{73}$ yr.; $M = £440\frac{2}{5} = £2202$.

$$P + \frac{P \times 8 \times \frac{1}{2}}{100 \times 73} = \frac{2202}{5} \therefore P = \frac{2202}{5} \times \frac{365}{367} = £438 = P.W.$$

$$\therefore D = £440 \text{ 8s.} - £438 = £2 \text{ 8s.}$$

- (22) From November 3rd to December 23rd (including 3 days' grace)
 = 50 days or $\frac{10}{13}$ yr.; $M = £2052\frac{1}{4} = £\frac{8211}{4}$.

$$P + \frac{P \times 25 \times 10}{100 \times 5 \times 73} = \frac{8211}{4} \therefore P = \frac{8211}{4} \times \frac{1173}{1173} = £2044 = P.W.$$

$$\therefore D = £2052 \text{ 15s.} - £2044 = £8 \text{ 15s.}$$

- (23) From October 19th to November 8th (including 3 days' grace)
 = 20 days or $\frac{4}{13}$ yr.; $M = £585\frac{1}{2} = £\frac{1171}{2}$.

$$P + \frac{P \times 15 \times 4}{100 \times 4 \times 73} = \frac{1171}{2} \therefore P = \frac{1171}{2} \times \frac{1469}{1469} = £584 = P.W.$$

$$\therefore D = £585 \text{ 4s.} - £584 = £1 \text{ 4s.}$$

- (24) From October 22nd to November 26th (including 3 days' grace)
 = 35 days or $\frac{7}{13}$ yr.; $M = £1684\frac{1}{4} = £\frac{6739}{4}$.

$$P + \frac{P \times 25 \times 7}{100 \times 7 \times 73} = \frac{6739}{4} \therefore P = \frac{6739}{4} \times \frac{292}{292} = £1679 = P.W.$$

$$\therefore D = £1684 \text{ 15s.} - £1679 = £5 \text{ 15s.}$$

- (25) From October 19th to November 28th (including 3 days' grace)
 = 40 days or $\frac{8}{13}$ yr.; $M = £1538\frac{2}{3} = £\frac{4615}{3}$.

$$P + \frac{P \times 10 \times 40}{100 \times 3 \times 365} = \frac{4615}{3} \therefore P = \frac{4615}{3} \times \frac{1095}{1095} = £1533 = P.W.$$

$$\therefore D = £1538 \text{ 15s.} - £1533 = £5 \text{ 12s.}$$

- (26) From August 20th to November 28th (including 3 days' grace)
 = 100 days or $\frac{20}{13}$ yr.; $M = £120\frac{1}{4} = £\frac{481}{4}$.

$$P + \frac{P \times 5 \times 20}{100 \times 73} = \frac{481}{4} \therefore P = \frac{481}{4} \times \frac{73}{73} = £240\frac{9}{8} = £118 \text{ 12s. 6d.} = P.W.$$

$$\therefore D = £120 \text{ 5s.} - £118 \text{ 12s. 6d.} = £1 \text{ 12s. 6d.}$$

- (27) From July 9th to August 23rd (including 3 days' grace) = 45 days
 or $\frac{9}{13}$ yr.; $M = £229\frac{1}{18} = £\frac{3665}{18}$.

$$P + \frac{P \times 10 \times 9}{100 \times 9 \times 73} = \frac{3665}{18} \therefore P = \frac{3665}{18} \times \frac{730}{730} = £228 \text{ 2s. 6d.} = P.W.$$

$$\therefore D = £229 \text{ 1s. 3d.} - £228 \text{ 2s. 6d.} = 18s. 9d.$$

- (28) From April 21st to May 6th (including 3 days' grace) = 15 days
or $\frac{2}{73}$ yr.; $M = £268\frac{13}{80} = £\frac{16023}{80}$.

$$P + \frac{P \times \frac{2}{73} \times 3}{100 \times 73} = \frac{16023}{80} \therefore P = \frac{16023}{80} \times \frac{1460}{1463} = £\frac{2923}{3} = £267 \text{ 13s. 4d.} = P.W.$$

$$\therefore D = £268 \text{ 4s. 4d.} - £267 \text{ 13s. 4d.} = 11s.$$

- (29) From October 17th to November 21st (including 3 days' grace)
= 35 days or $\frac{1}{73}$ yr.; $M = £671\frac{11}{15} = £\frac{10076}{15}$.

$$P + \frac{P \times \frac{1}{73} \times 7}{100 \times 73} = \frac{10076}{15} \therefore P = \frac{10076}{15} \times \frac{1825}{1832} = £\frac{4015}{8} = £669 \text{ 3s. 4d.} = P.W.$$

$$\therefore D = £671 \text{ 14s. 8d.} - £669 \text{ 3s. 4d.} = £2 \text{ 11s. 4d.}$$

- (30) From October 20th to November 5th (including 3 days' grace)
= 16 days or $\frac{16}{365}$ yr.; $M = £383\frac{31}{40} = £\frac{15351}{40}$.

$$P + \frac{P \times \frac{16}{365} \times 25}{100 \times \frac{16}{365} \times 365} = \frac{15351}{40} \therefore P = \frac{15351}{40} \times \frac{730}{731} = £\frac{1533}{4} = £383 \text{ 5s.} = P.W.$$

$$\therefore D = £383 \text{ 15s. 6d.} - £383 \text{ 5s.} = 10s. 6d.$$

- (31) From July 15th to September 26th (including 3 days' grace)
= 73 days or $\frac{1}{5}$ yr.; $M = £4112\frac{1}{2} = £\frac{8225}{2}$.

$$P + \frac{P \times \frac{1}{5} \times 1}{100 \times 7 \times 5} = \frac{8225}{2} \therefore P = \frac{8225}{2} \times \frac{140}{141} = £\frac{12250}{3} = £4083 \text{ 6s. 8d.}$$

$$= P.W.$$

$$\therefore D = £4112 \text{ 10s.} - £4083 \text{ 6s. 8d.} = £29 \text{ 3s. 4d.}$$

- (32) From July 27th to September 20th (including 3 days' grace)
= 55 days or $\frac{1}{12}$ yr.; $M = £611\frac{1}{12} = £\frac{7333}{12}$.

$$P + \frac{P \times \frac{1}{12} \times 11}{100 \times 73} = \frac{7333}{12} \therefore P = \frac{7333}{12} \times \frac{7900}{7333} = £\frac{1825}{3} = £608 \text{ 6s. 8d.} = P.W.$$

$$\therefore D = £611 \text{ 1s. 8d.} - £608 \text{ 6s. 8d.} = £2 \text{ 15s.}$$

- (33) From November 11 to December 6th (including 3 days' grace)
= 25 days or $\frac{5}{73}$ yr.

$$P + \frac{P \times \frac{5}{73} \times 5}{100 \times 2 \times 73} = £715 \therefore P = \frac{715}{1} \times \frac{584}{585} = £\frac{6424}{9} = £713 \text{ 15s. } 6\frac{2}{3}\text{d.}$$

$$= P.W.$$

$$\therefore D = £715 - £713 \text{ 15s. } 6\frac{2}{3}\text{d.} = £1 \text{ 4s. } 5\frac{1}{3}\text{d.}$$

- (34) From October 19th to December 24th (including 3 days' grace) = 66 days or $\frac{66}{365}$ yr.; $M = £4910\frac{2}{3} = £\frac{14732}{3}$.

$$P + \frac{P \times 5 \times 66}{100 \times 365} = \frac{14732}{3} \therefore P = \frac{14600}{3} \times \frac{3650}{3683} = £\frac{14732}{3} = £4866 \text{ 13s. 4d.}$$

$$10$$

$$= P.W.$$

$$\therefore D = £4910 \text{ 13s. 4d.} - £4866 \text{ 13s. 4d.} = £44.$$

- (35) From June 25th to September 10th (including 3 days' grace) = 77 days or $\frac{77}{365}$ yr.

$$P + \frac{P \times 25 \times 77}{100 \times 8 \times 365} = £3919 \therefore P = \frac{3919}{1} \times \frac{11680}{11757} = £\frac{11680}{3}$$

$$4$$

$$= £3893 \text{ 6s. 8d.} = P.W.$$

$$\therefore D = £3919 - £3893 \text{ 6s. 8d.} = £25 \text{ 13s. 4d.}$$

EXERCISE LVII., p. 104.

- (1) From March 11th to April 5th (including 3 days' grace) = 25 days;
 $P = £326 \text{ 13s. 6d.} = £\frac{13067}{40}$.

$$\text{Discount} = \frac{13067 \times 5 \times 25}{100 \times 40 \times 365} l. = £\frac{179}{160} = £1 \text{ 2s. } 4\frac{1}{4}d.$$

- (2) From July 3rd to August 12th (including 3 days' grace) = 40 days;
 $P = £1812 \text{ 16s. 8d., or } £\frac{10877}{6}$.

$$\text{Discount} = \frac{10877 \times 5 \times 40}{100 \times 6 \times 365} l. = £\frac{149}{15} = £9 \text{ 18s. 8d.}$$

- (3) From July 6th to August 3rd (including 3 days' grace) = 28 days;
 $P = £342 \text{ 3s. 9d.} = £\frac{27375}{80}$.

$$\text{Discount} = \frac{27375 \times 16 \times 28}{80 \times 100 \times 3 \times 365} l. = £\frac{7}{5} = £1 \text{ 8s.}$$

- (4) From June 14th to February 9th (including 3 days' grace) = 240 days;
 $P = £2402 \text{ 18s. 4d.} = £\frac{28835}{13}$.

$$\text{Discount} = \frac{28835 \times 9 \times 240}{100 \times 12 \times 2 \times 365} l. = £\frac{711}{10} = £71 \text{ 2s.}$$

- (5) From November 28th to January 7th (including 3 days' grace)
= 40 days.

$$\text{Discount} = \frac{14089 \times 5 \times 40}{100 \times 365} \text{ l.} = \frac{\text{£}389}{5} = \text{£}77 \text{ 4s.}$$

- (6) From July 1st to October 4th (including 3 days' grace) = 95 days ;
 $P = \text{£}6478 \text{ 15s.} = \frac{\text{£}25915}{4}.$

$$\text{Discount} = \frac{25915 \times 15 \times 95}{100 \times 4 \times 4 \times 365} \text{ l.} = \frac{\text{£}4947}{84} = \text{£}63 \text{ 4s. 8}\frac{1}{4}\text{d.}$$

- (7) From September 2nd to January 26th (including 3 days' grace)
= 146 days ; $P = \text{£}5318 \text{ 15s.} = \frac{\text{£}21275}{4}.$

$$\text{Discount} = \frac{21275 \times 146 \times 4}{100 \times 4 \times 365} \text{ l.} = \frac{\text{£}851}{10} = \text{£}85 \text{ 2s.}$$

- (8) From April 22nd to June 6th (including 3 days' grace) = 45 days ;
 $P = \text{£}5864 \text{ 6s. 8d.} = \frac{\text{£}17593}{3}.$

$$\text{Discount} = \frac{17593 \times 45 \times 5}{3 \times 100 \times 365} \text{ l.} = \frac{\text{£}723}{20} = \text{£}36 \text{ 3s.}$$

- (9) From July 15th to September 26th (including 3 days' grace) = 73
days ; $P = \text{£}2479 \text{ 3s. 4d.} = \frac{\text{£}14875}{6}.$

$$\text{Discount} = \frac{14875 \times 25 \times 73}{100 \times 6 \times 7 \times 365} = \frac{\text{£}425}{24} = \text{£}17 \text{ 14s. 2d.}$$

- (10) From October 7th to December 21st (including 3 days' grace) = 75
days ; $P = \text{£}4866 \text{ 13s. 4d.} = \frac{\text{£}14600}{3}.$

$$\text{Discount} = \frac{14600 \times 25 \times 75}{100 \times 3 \times 8 \times 365} \text{ l.} = \frac{\text{£}125}{4} = \text{£}31 \text{ 5s.}$$

- (11) From August 12th to September 3rd (including 3 days' grace) = 25
days ; $P = \text{£}28129 \text{ 6s. 8d.} = \frac{\text{£}84388}{3}.$

$$\text{Discount} = \frac{84388 \times 5 \times 25}{100 \times 3 \times 365} \text{ l.} = \frac{\text{£}289}{3} = \text{£}96 \text{ 6s. 8d.}$$

- (12) From September 27th to November 13th (including 3 days' grace)
= 50 days ; $P = \text{£}13079 \text{ 3s. 4d.} = \frac{\text{£}78475}{6}.$

$$\text{Discount} = \frac{78475 \times 4 \times 50}{100 \times 6 \times 365} \text{ l.} = \frac{\text{£}215}{3} = \text{£}71 \text{ 13s. 4d.}$$

EXERCISE LVIII, p. 106.

- (1) £95 : £47500 :: £100 : $\frac{47500 \times 100}{95}l = £50000$.
- (2) £94½ : £4347 :: £100 : $\frac{4347 \times 100 \times 2}{189}l = £4600$.
- (3) £100 : £2880 :: £ $\frac{9}{40}$: $\frac{2880 \times 9}{100 \times 40}l = £\frac{192}{25} = £6$ 9s. 7½d.
- (4) £100 : £1428½ :: £3½ : $£\frac{7144}{5} \times \frac{25}{8} \times \frac{1}{100} = £\frac{893}{20} = £44$ 13s.
- (5) £96½ : £11381½ :: £100 : $£\frac{219533}{80} \times \frac{100}{1} \times \frac{5}{481} = £\frac{47325}{4} = £11831$ 5s.
- (6) £100 : £4000 :: £3¼ : $\frac{4000 \times 15}{100 \times 4}l = £150$.
- (7) £96¼ : £770 :: £100 : $\frac{770 \times 100 \times 4}{385}l = £800$.
- (8) £96 : £1132½ :: £100 : $\frac{5664 \times 100}{96 \times 5}l = £1180$.
- (9) £97½ : £12236½ :: £100 : $£\frac{48945}{4} \times \frac{100}{1} \times \frac{2}{193} = £12550$.
- (10) £100 : £1609½ :: £1½ : $£\frac{12875}{8} \times \frac{1}{8} \times \frac{1}{100} = £\frac{515}{256} = £2$ 0s. 2½d.
- (11) £95½ : £5539 :: £100 : $\frac{5539 \times 100 \times 2}{191}l = £5800$.
- (12) £100 : £25620 :: £3¾ : $\frac{25620 \times 25}{100 \times 7}l = £915$.
- (13) £96⅔ : £385 1s. 11d. :: £100 : $£\frac{92423}{240} \times \frac{100}{1} \times \frac{3}{480} = £\frac{3187}{8} = £398$ 7s. 6d.
- (14) £100 : £366⅔ :: £1⅓ : $£\frac{1100}{3} \times \frac{1}{8} \times \frac{1}{100} = £\frac{11}{18} = 12$ s. 2⅓d.
- (15) £96¼ : £179½ :: £100 : $£\frac{539}{1} \times \frac{100}{1} \times \frac{4}{385} = £\frac{560}{1} = £186$ 13s. 4d.
- (16) £100 : £533⅓ :: £1½ : $£\frac{1600}{3} \times \frac{3}{2} \times \frac{1}{100} = £8$.
- (17) £90⅔ : £1673⅞ :: £100 : $£\frac{16737}{10} \times \frac{100}{1} \times \frac{8}{797} = £1680$.
- (18) £100 : £4560 :: £3¼ : $\frac{4560 \times 15}{100 \times 4}l = £171$.
- (19) £96⅔ : £403 12s. 11d. :: £100 : $£\frac{96875}{240} \times \frac{100}{1} \times \frac{8}{775} = £\frac{1250}{3} = £416$ 13s. 4d.
- (20) £99¼ : £3790½ :: £100 : $£\frac{7581}{2} \times \frac{100}{1} \times \frac{4}{395} = £3800$.
- (21) £100 : £2500 :: £1¼ : $\frac{2500 \times 69}{100 \times 40}l = £\frac{335}{8} = £41$ 17s. 6d.

(2) i. $£97\frac{3}{4} : £8211 :: £100 : \frac{8211 \times 100 \times 4}{391}l. = £8400.$

ii. $£100 : £8400 :: £2\frac{1}{4} : \frac{8400 \times 9}{100 \times 4}l. = £189$ cost of insurance.

(3) $£100 : £1787\frac{1}{2} :: £\frac{1}{8} : \frac{£1787\frac{1}{2} \times \frac{1}{8} \times \frac{1}{100}}{100 \times 4}l. = £\frac{143}{84} = £2$ 4s. 8 $\frac{1}{4}$ d.

(4) $£100 : £2500 :: £1\frac{1}{3} : \frac{2500 \times 4}{100 \times 3}l. = £\frac{100}{3} = £33$ 6s. 8d.

(5) $£100 : £583\frac{13}{12} :: £3\frac{1}{8} : \frac{£583\frac{13}{12} \times \frac{25}{8} \times \frac{1}{100}}{100 \times 4}l. = £\frac{1379}{240} = £18$ 4s. 11d.

(6) $£100 : £10856\frac{2}{3} :: £\frac{1}{8} : \frac{£10856\frac{2}{3} \times \frac{1}{8} \times \frac{1}{100}}{100 \times 4}l. = £\frac{257}{240} = £13$ 11s. 5d.

(7) $£96\frac{1}{4} : £481\frac{1}{4} :: £100 : \frac{£481\frac{1}{4} \times \frac{100}{1} \times \frac{4}{355}}{100 \times 4}l. = £500.$

(8) $£100 : £1200 :: £2\frac{1}{2} : \frac{1200 \times 5}{100 \times 2}l. = £30.$

(9) $£100 : £17986\frac{2}{3} :: £4\frac{1}{8} : \frac{£17986\frac{2}{3} \times \frac{25}{8} \times \frac{1}{100}}{100 \times 4}l. = £\frac{22483}{360} = £749$ 8s. 8d.

(30) i. $£96\frac{2}{3} : £48628\frac{1}{3} :: £100 : \frac{£48628\frac{1}{3} \times \frac{100}{1} \times \frac{2}{250}}{100 \times 4}l. = £50305.$

ii. $£100 : £50305 :: £3\frac{1}{3} : \frac{50305 \times 10}{100 \times 3}l. = £\frac{10061}{3} = £1676$ 16s. 8d.

cost of insurance.

EXERCISE LIX., p. 110.

(1) 5 p.c. = $\frac{5}{100} = \frac{1}{20}$. $\therefore M = (1\frac{1}{20})^5 \times £2666\frac{2}{3}.$

$M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times £2666\frac{2}{3} = £3087.$

C.I. = $£3087 - £2666$ 13s. 4d. = $£420$ 6s. 8d.

(2) 5 p.c. = $\frac{5}{100} = \frac{1}{20}$. $\therefore M = (1\frac{1}{20})^5 \times £500.$

$M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times £500 = £\frac{92261}{16} = £578$ 16s. 3d.

C.I. = $£578$ 16s. 3d. - $£500 = £78$ 16s. 3d.

(3) 5 p.c. = $\frac{5}{100} = \frac{1}{20}$. $\therefore M = (1\frac{1}{20})^5 \times £28666\frac{2}{3}.$

$M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times £28666\frac{2}{3} = £\frac{132741}{4} = £33185$ 5s.

C.I. = $£33185$ 5s. - $£28666$ 13s. 4d. = $£4518$ 11s. 8d.

(4) 4 p.c. = $\frac{4}{100} = \frac{1}{25}$. $\therefore M = (1\frac{1}{25})^4 \times £8333\frac{1}{3}.$

$M = \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times £8333\frac{1}{3} = £\frac{140808}{15} = £9373$ 17s. 4d.

C.I. = $£9373$ 17s. 4d. - $£8333$ 6s. 8d. = $£1040$ 10s. 8d.

(5) 4 p.c. = $\frac{4}{100} = \frac{1}{25}$. $\therefore M = (1\frac{1}{25})^4 \times £3906\frac{1}{4}.$

$M = \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times £3906\frac{1}{4} = £\frac{114244}{25} = £4569$ 15s. 2 $\frac{2}{5}$ d.

C.I. = $£4569$ 15s. 2 $\frac{2}{5}$ d. - $£3906$ 5s. = $£663$ 10s. 2 $\frac{2}{5}$ d.

(6) 4 p.c. = $\frac{4}{100} = \frac{1}{25}$. $\therefore M = (1\frac{1}{25})^4 \times £5000.$

$M = \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times £5000 = £\frac{140808}{25} = £5624$ 6s. 4 $\frac{4}{5}$ d.

C.I. = $£5624$ 6s. 4 $\frac{4}{5}$ d. - $£5000 = £624$ 6s. 4 $\frac{4}{5}$ d.

- (7) 3 p.c. = $\frac{3}{100} = \frac{1}{30} \therefore M = (1\frac{1}{30})^3 \times £1800$.
 $M = \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} \times \frac{1800}{1} = £1750\frac{329}{800} = £2187\ 18s. 2\frac{7}{10}d$.
 C.I. = £2187 18s. $2\frac{7}{10}d$. - £1800 = £387 18s. $2\frac{7}{10}d$.
- (8) 15 p.c. = $\frac{15}{100} = \frac{3}{20} \therefore M = (1\frac{3}{20})^3 \times £981\frac{1}{2}$.
 $M = \frac{23}{20} \times \frac{23}{20} \times \frac{23}{20} \times \frac{981\frac{1}{2}}{1} = £1315\frac{1101}{800} = £1095\ 18s. 6\frac{1}{5}d$.
 C.I. = £1095 18s. $6\frac{1}{5}d$. - £981 6s. 8d. = £114 11s. $10\frac{1}{5}d$.
- (9) $3\frac{1}{2}$ p.c. = $\frac{7}{200} = \frac{1}{28} \therefore M = (1\frac{1}{28})^3 \times £421875$.
 $M = \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{421875}{1} = £493039$.
 C.I. = £493039 - £421875 = £71164.
- (10) $3\frac{1}{2}$ p.c. = $\frac{7}{200} = \frac{1}{28} \therefore M = (1\frac{1}{28})^4 \times £136532\frac{1}{2}$.
 $M = \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{136532\frac{1}{2}}{1} = £1745832\frac{1}{300} = £158194\ 8s. 0\frac{1}{2}d$.
 C.I. = £158194 8s. $0\frac{1}{2}d$. - £136533 6s. 8d. = £21661 1s. $4\frac{1}{2}d$.
- (11) 5 p.c. = $\frac{5}{100} = \frac{1}{20} \therefore M = (1\frac{1}{20})^5 \times £10000$.
 $M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{10000}{1} = £13400\ 19s. 1\frac{13}{20}d$.
 C.I. = £13400 19s. $1\frac{13}{20}d$. - £10000 = £3400 19s. $1\frac{13}{20}d$.
- (12) $3\frac{1}{2}$ p.c. = $\frac{7}{200} = \frac{1}{28} \therefore M = (1\frac{1}{28})^3 \times £166666\frac{2}{3}$.
 $M = \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{166666\frac{2}{3}}{1} = £184786\ 6s. 3d$.
 C.I. = £184786 6s. 3d. - £166666 13s. 4d. = £18119 12s. 11d.
- (13) $3\frac{1}{2}$ p.c. = $\frac{7}{200} = \frac{1}{28} \therefore M = (1\frac{1}{28})^3 \times £2700$.
 $M = \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{2700}{1} = £2979\ 2s$.
 C.I. = £2979 2s. - £2700 = £279 2s.
- (14) 5 p.c. = $\frac{5}{100} = \frac{1}{20} \therefore M = (1\frac{1}{20})^5 \times £1466666\frac{2}{3}$.
 $M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{1466666\frac{2}{3}}{1} = £314475777\frac{1}{160}$
 $= £1965473\ 12s. 1\frac{1}{2}d$.
 C.I. = £1965473 12s. $1\frac{1}{2}d$. - £1466666 13s. 4d. = £498806 18s. $9\frac{1}{2}d$.
- (15) $3\frac{1}{2}$ p.c. = $\frac{7}{200} = \frac{1}{28} \therefore M = (1\frac{1}{28})^3 \times £34166\frac{2}{3}$.
 $M = \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{34166\frac{2}{3}}{1} = £37698\ 9s. 9\frac{1}{2}d$.
 C.I. = £37698 9s. $9\frac{1}{2}d$. - £34166 13s. 4d. = £3531 16s. $5\frac{1}{2}d$.
- (16) $3\frac{1}{2}$ p.c. = $\frac{7}{200} = \frac{1}{28} \therefore M = (1\frac{1}{28})^4 \times £540000$.
 $M = \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{29}{28} \times \frac{540000}{1} = £1847042\frac{1}{3} = £615680\ 13s. 4d$.
 C.I. = £615680 13s. 4d. - £540000 = £75680 13s. 4d.
- (17) $5\frac{1}{2}$ p.c. = $\frac{11}{200} = \frac{1}{30} \therefore M = (1\frac{1}{30})^4 \times £83333\frac{1}{3}$.
 $M = \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} \times \frac{83333\frac{1}{3}}{1} = £103235\ 7s. 9\frac{1}{5}d$.
 C.I. = £103235 7s. $9\frac{1}{5}d$. - £83333 6s. 8d. = £19902 1s. $1\frac{1}{5}d$.
- (18) $4\frac{1}{2}$ p.c. = $\frac{9}{200} = \frac{1}{22} \therefore M = (1\frac{1}{22})^3 \times £651051\frac{2}{3}$.
 $M = \frac{23}{22} \times \frac{23}{22} \times \frac{23}{22} \times \frac{651051\frac{2}{3}}{1} = £749363\ 13s. 4d$.
 C.I. = £749363 13s. 4d. - £651041 13s. 4d. = £98322.

- 1) $4\frac{1}{4}$ p.c. = $\frac{17}{400} \therefore M = (1\frac{17}{400})^4 \times £266666\frac{2}{3}$.
 $M = \frac{417}{400} \times \frac{417}{400} \times \frac{417}{400} \times \frac{417}{400} \times \frac{800000}{3} = £2417957\frac{1}{8} = £302132 \text{ 2s. 9d.}$
 C.I. = £302132 2s. 9d. - £266666 13s. 4d. = £35465 9s. 5d.
- 2) $4\frac{2}{3}$ p.c. = $\frac{34}{500} = \frac{6}{125} \therefore M = (1\frac{6}{125})^3 \times £325520\frac{5}{8}$.
 $M = \frac{131}{125} \times \frac{131}{125} \times \frac{131}{125} \times \frac{1953125}{8} = £224809\frac{1}{8} = £374681 \text{ 16s. 8d.}$
 C.I. = £374681 16s. 8d. - £325520 16s. 8d. = £49161.
- 1) $6\frac{2}{3}$ p.c. = $\frac{20}{300} = \frac{1}{15} \therefore M = (1\frac{1}{15})^4 \times £12656\frac{1}{4}$.
 $M = \frac{16}{15} \times \frac{16}{15} \times \frac{16}{15} \times \frac{16}{15} \times \frac{50625}{4} = £16384$.
 C.I. = £16384 - £12656 5s. = £3727 15s.
- 2) $5\frac{1}{3}$ p.c. = $\frac{16}{300} = \frac{4}{75} \therefore M = (1\frac{4}{75})^4 \times £263671\frac{7}{8}$.
 $M = \frac{79}{75} \times \frac{79}{75} \times \frac{79}{75} \times \frac{79}{75} \times \frac{2125375}{8} = £3885008\frac{1}{8} = £324584 \text{ 0s. 2d.}$
 C.I. = £324584 0s. 2d. - £263671 17s. 6d. = £60912 2s. 8d.
- 3) 5 p.c. = $\frac{5}{100} = \frac{1}{20} \therefore M = (1\frac{1}{20})^6 \times £147666\frac{2}{3}$.
 $M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{4480000}{3} = £1266479720\frac{1}{8}$
 $= £1978874 \text{ 11s. } 3\frac{3}{80}\text{d.}$
 C.I. = £1978874 11s. $3\frac{3}{80}\text{d.}$ - £1476666 13s. 4d. = £502207 17s. $11\frac{3}{80}\text{d.}$
- 4) $3\frac{1}{3}$ p.c. = $\frac{10}{300} = \frac{1}{30} \therefore M = (1\frac{1}{30})^5 \times £13644000$.
 $M = \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} \times \frac{31}{30} \times \frac{13644000}{1} = £1085044822\frac{2}{9}$
 $= £16074738 \text{ 2s. } 4\frac{4}{45}\text{d.}$
 C.I. = £16074738 2s. $4\frac{4}{45}\text{d.}$ - £13644000 = £2430738 2s. $4\frac{4}{45}\text{d.}$
- 5) $4\frac{4}{5}$ p.c. = $\frac{24}{500} = \frac{6}{125} \therefore M = (1\frac{6}{125})^4 \times £60722656\frac{1}{4}$.
 $M = \frac{131}{125} \times \frac{131}{125} \times \frac{131}{125} \times \frac{131}{125} \times \frac{242890625}{4} = £91620753388\frac{9}{16}$
 $= £73248020 \text{ 7s. } 0\frac{188}{325}\text{d.}$
 C.I. = £73248020 7s. $0\frac{188}{325}\text{d.}$ - £60722656 5s. = £12525364 2s. $0\frac{188}{325}\text{d.}$
- 16) 4 p.c. = $\frac{4}{100} = \frac{1}{25} \therefore M = (1\frac{1}{25})^3 \times £1500$.
 $M = \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25} \times \frac{1500}{1} = £2109\frac{12}{125}$
 C.I. = £1689 5s. $11\frac{1}{25}\text{d.}$ - £1500 = £187 5s. $11\frac{1}{25}\text{d.}$
- 27) $2\frac{1}{4}$ p.c. = $\frac{9}{400} \therefore M = (1\frac{9}{400})^2 \times £15400$.
 $M = \frac{409}{400} \times \frac{409}{400} \times \frac{15400}{1} = £2588063\frac{7}{800}$
 C.I. = £16100 15s. $11\frac{1}{10}\text{d.}$ - £15400 = £700 15s. $11\frac{1}{10}\text{d.}$
- 28) 5 p.c. = $\frac{5}{100} = \frac{1}{20} \therefore M = (1\frac{1}{20})^5 \times £750$.
 $M = \frac{41}{20} \times \frac{41}{20} \times \frac{41}{20} \times \frac{41}{20} \times \frac{41}{20} \times \frac{750}{1} = £24758880\frac{3}{8}$
 C.I. = £848 11s. $12\frac{449}{120}\text{d.}$ - £750 = £98 11s. $12\frac{449}{120}\text{d.}$
- 19) $3\frac{3}{4}$ p.c. = $\frac{15}{400} = \frac{3}{80} \therefore M = (1\frac{3}{80})^4 \times £990$.
 $M = \frac{83}{80} \times \frac{83}{80} \times \frac{83}{80} \times \frac{83}{80} \times \frac{990}{1} = £4698373\frac{779}{8000}$
 C.I. = £1147 1s. $3\frac{17337}{51200}\text{d.}$ - £990 = £157 1s. $3\frac{17337}{51200}\text{d.}$

$$(30) 3\frac{1}{2} \text{ p.c.} = \frac{7}{200} \therefore M = \left(\frac{1}{\frac{7}{200}}\right)^2 \times £10000.$$

$$M = \frac{200}{7} \times \frac{200}{7} \times \frac{200}{7} \times \frac{200}{7} \times \frac{200}{7} \times \frac{10000}{1} = £\frac{3200059917807}{320000000}$$

$$= £11876 \text{ 17s. } 3\frac{53421}{400000}d.$$

$$C.L. = £11876 \text{ 17s. } 3\frac{53421}{400000}d. - £10000 = £1876 \text{ 17s. } 3\frac{53421}{400000}d.$$

EXERCISE LX., p. 112.

$$(1)^* 5 \text{ per cent.} = \frac{1}{20} \text{ gain.}$$

$$\therefore 1\frac{1}{20} : 1 :: 1\frac{1}{2} \text{ s.} : \frac{1 \times 7 \times 20}{21 \times 4} \text{ s.} = \frac{5}{3} \text{ s.} = 1 \text{ s. } 8d. \text{ cost price.}$$

$$(2) 5 \text{ per cent.} = \frac{1}{20} \text{ loss.}$$

$$\therefore 1 - \frac{1}{20} \text{ or } \frac{19}{20} : 1 :: 3\frac{1}{2} \text{ s.} : \frac{19 \times 20}{6 \times 19} \text{ s.} = \frac{19}{3} \text{ s.} = 3 \text{ s. } 4d. \text{ cost price.}$$

$$(3) 10 \text{ per cent.} = \frac{1}{10} \text{ gain.}$$

$$\therefore 1\frac{1}{10} : 1 :: 11 \text{ s.} : \frac{10 \times 11}{11} \text{ s.} = 10 \text{ s. cost price.}$$

$$(4) 6\frac{1}{2} \text{ per cent.} = \frac{35}{400} \text{ or } \frac{1}{16} \text{ loss.}$$

$$\therefore 1 - \frac{1}{16} \text{ or } \frac{15}{16} : 1 :: £4\frac{1}{2} : \frac{16 \times 9}{15 \times 2} \text{ l.} = £\frac{24}{5} = £4 \text{ 16s. cost price.}$$

$$(5) 5 \text{ per cent.} = \frac{1}{20} \text{ loss.}$$

$$\therefore 1 - \frac{1}{20} \text{ or } \frac{19}{20} : 1 :: 19 \text{ s.} : \frac{20 \times 19}{19} = 20 \text{ s. cost price.}$$

$$\therefore \text{selling price to gain 15 per cent.} = 1\frac{15}{100}, \text{ or } \frac{23}{20} \text{ of } \frac{20}{1} = 23 \text{ s., or } £1 \text{ 3s.}$$

$$(6) 8 \text{ per cent.} = \frac{2}{25} \text{ loss.}$$

$$\therefore 1 - \frac{2}{25} \text{ or } \frac{23}{25} : 1 :: 12 \text{ s.} : \frac{25 \times 12}{23} \text{ s.} = \frac{300}{23} \text{ s.} = 13\frac{1}{23} \text{ s. cost price.}$$

$$\text{Gain} = 15 \text{ s.} - 13\frac{1}{23} \text{ s.} = 1\frac{22}{23} \text{ s.}$$

$$\therefore \text{gain per cent.} = \frac{1\frac{22}{23} \times 100}{13\frac{1}{23}} = \frac{23 \times 100 \times 45}{300 \times 23} = 15.$$

$$(7) \text{Gain} = (9 \times 2 \text{ s.}) - 15 \text{ s.} = 3 \text{ s.}$$

$$\therefore \text{gain per cent.} = \frac{100 \times 3}{15} = 20.$$

$$(8) 4 \text{ per cent.} = \frac{1}{25} \text{ loss.}$$

$$\therefore 1 - \frac{1}{25} \text{ or } \frac{24}{25} : 1 :: 16 \text{ s.} : \frac{25 \times 16}{24} \text{ s.} = \frac{50}{3} \text{ s.} = 16\frac{2}{3} \text{ s. cost price.}$$

$$\therefore \text{selling price to gain 20 per cent.} = 1\frac{20}{100} \text{ of } 16\frac{2}{3} = 20 \text{ s., or } £1.$$

$$(9) \text{Gain} = 6 \text{ s. } 10d. - 5 \text{ s. } 4d. = 8d.$$

$$\therefore \text{gain per cent.} = \frac{100 \times 8}{64} = \frac{25}{2} = 12\frac{1}{2}.$$

* It will be found more convenient in the following examples to reduce the percentage to a fractional form; thus: 5 per cent. = $\frac{1}{20}$ or $\frac{1}{20}$, 6½ per cent. = $\frac{13}{40}$ or $\frac{13}{40}$, &c. Let 1 always represent the cost price. \therefore if 5 per cent. be gained $1 + \frac{1}{20}$ or $1\frac{1}{20}$ = selling price: or if 5 per cent. be lost $1 - \frac{1}{20}$ or $\frac{19}{20}$ = selling price.

0) Gain = 2s. 3d. - 1s. 6d. = 9d.

\therefore gain per cent. on every lb. = $\frac{9 \times 100}{18} = 50$.

\therefore 1 lb. must be sold to gain 50 per cent.

1) Selling price per lb. = £35 ÷ 112 = 6s. 3d.

$1\frac{1}{4} : 1 :: 6\frac{1}{4}s. : \frac{25 \times 4}{5 \times 4}s. = 5s.$ cost price.

2) Selling price = $1\frac{1}{2}$ of 5d. = $\frac{3}{2}$ of $\frac{4}{5}$ = 6d.

3) Gain = 5s. 3d. - 4s. 6d. = 9d.

\therefore gain per cent. = $\frac{9 \times 100}{54} = \frac{50}{3} = 16\frac{2}{3}$.

4) Loss = 15s. - 13s. 6d. = 1s. 6d.

\therefore loss per cent. = $\frac{1\frac{1}{2} \times 100}{15} = \frac{3 \times 100}{2 \times 15} = 10$.

5) $1 - \frac{1}{20}$ or $\frac{19}{20} : 1 :: £11\frac{1}{2} : \frac{57 \times 20}{5 \times 19}l. = £12$ cost price.

Loss = £12 - £11 11s. = 9s.

\therefore loss per cent. = $\frac{9 \times 100}{12 \times 20} = \frac{15}{4} = 3\frac{3}{4}$.

3) Gain = 14s. 9d. - 12s. 6d. = 2s. 3d.

\therefore gain per cent. = $\frac{2\frac{1}{2} \times 100}{12\frac{1}{2}} = \frac{9 \times 100 \times 2}{25 \times 4} = 18$.

7) $1\frac{1}{4} : 1 :: 5s. : \frac{4 \times 5}{5}s. = 4s.$ cost price.

Gain = 4s. 6d. - 4s. = 6d.

\therefore gain per cent. = $\frac{\frac{1}{2} \times 100}{4} = 12\frac{1}{2}$.

8) Cost price = $(3s. 3\frac{1}{2}d. \times 4) + (5s. 4d. \times 3) = 29s. 2d.$

Selling price = 4s. 10d. $\times 7 = 33s. 10d.$

\therefore gain = 33s. 10d. - 29s. 2d. = 4s. 8d.

Gain per cent. = $\frac{4\frac{2}{3} \times 100}{29\frac{1}{3}} = \frac{14 \times 100 \times 6}{175 \times 3} = 16$.

9) Selling price of whole = $1\frac{15}{100} \times 52$ g. or $\frac{23}{20} \times \frac{105}{2}l. = £60$ 7s. 6d.

Cost price of 15 = $\frac{15 \times 52\frac{1}{2}}{35} = £22$ 10s.

\therefore selling price of 15 = $1 - \frac{1}{20}$, or $\frac{19}{20}$ of $22\frac{1}{2}l. = £21$ 7s. 6d.

\therefore selling price of remaining 20 sheep = £60 7s. 6d. - £21 7s. 6d. = £39.

\therefore selling price per sheep of remainder = £39 ÷ 20 = £1 19s.

$$(20) 1\frac{1}{10} : 1 :: 30s. : \frac{10 \times 30}{11}s. = \frac{300}{11}s. = 27\frac{3}{11}s. \text{ cost price.}$$

$$\therefore \text{gain} = 36s. - 27\frac{3}{11}s. = 8\frac{8}{11}s.$$

$$\text{Gain per cent.} = \frac{100 \times 8\frac{8}{11}}{27\frac{3}{11}} = \frac{100 \times 96 \times 11}{300 \times 11} = 32.$$

$$(21) 1 - \frac{1}{10} \text{ or } \frac{9}{10} : 1 :: 15s. : \frac{10 \times 15}{9}s. = \frac{50}{3}s. = 16\frac{2}{3}s. \text{ cost price.}$$

$$\therefore \text{selling price to gain 20 p.c.} = 1\frac{1}{2} \text{ of } 16\frac{2}{3}s. = \frac{2}{3} \times \frac{50}{3} = 20s., \text{ or } £1.$$

$$(22) \text{ Cost price per lb.} = \frac{£68 \text{ } 19s. \text{ } 2d. \times 1 \text{ lb.}}{1 \text{ ton } 2 \text{ cwt. } 0 \text{ qrs. } 18\frac{1}{2} \text{ lbs.}} = \frac{16550 \times 1 \times 2}{4965}d. \\ = \frac{33100}{4965}d. = 6\frac{2}{3}d.$$

$$\therefore \text{selling price to realise a profit of 20 p.c.} = 1\frac{1}{2} \text{ of } 6\frac{2}{3}d. = 8d.$$

$$(23) 1\frac{1}{4} : 1 :: 4\frac{1}{2}s. : \frac{1\frac{1}{4} \times 4}{3 \times 5}s. = \frac{4}{5}s. = 3s. \text{ } 8\frac{1}{2}d. \text{ cost price.}$$

$$\text{Loss} = 3s. \text{ } 8\frac{1}{2}d. - 3s. \text{ } 4d. = 4\frac{1}{2}d.$$

$$\therefore \text{loss per cent.} = \frac{100 \times 4\frac{1}{2}d.}{3s. \text{ } 8\frac{1}{2}d.} = \frac{100 \times 24 \times 5}{224 \times 5} = \frac{75}{7} = 10\frac{5}{7}.$$

$$(24) \text{ Cost price per lb.} = £20 \text{ } 6s. \text{ } 3d. + 125 = 3s. \text{ } 3d.$$

$$\therefore \text{selling price to gain 20 p.c.} = 1\frac{1}{2} \text{ of } 3s. \text{ } 3d. = 3s. \text{ } 10\frac{1}{2}d.$$

$$(25) 1 - \frac{1}{10} \text{ or } \frac{9}{10} : 1 :: 10s. : \frac{20 \times 10}{19}s. = \frac{200}{19}s. = 10s. \text{ } 6\frac{10}{19}d. \text{ cost price.}$$

$$\text{Gain} = 12s. \text{ } 6d. - 10s. \text{ } 6\frac{10}{19}d. = 1s. \text{ } 11\frac{13}{19}d.$$

$$\therefore \text{gain per cent.} = \frac{100 \times 1s. \text{ } 11\frac{13}{19}d.}{10s. \text{ } 6\frac{10}{19}d.} = \frac{75}{4} = 18\frac{3}{4}.$$

$$(26) \text{ Cost price} = £88 \text{ } 4s. + £63 = £151 \text{ } 4s.$$

$$\text{Selling price} = (126 \text{ doz.} \times 36s.) = £226 \text{ } 16s.$$

$$\therefore \text{entire gain} = £226 \text{ } 16s. - £151 \text{ } 4s. = £75 \text{ } 12s.$$

$$\text{and gain per cent.} = \frac{100 \times 75\frac{1}{2}}{151\frac{1}{2}} = \frac{100 \times 378 \times 5}{756 \times 5} = 50.$$

$$(27) \text{ Number of cwt. bought} = 400 \times 1\frac{1}{4} \text{ cwt.} = 500.$$

$$1\frac{1}{10} : 1 :: £13\frac{1}{2} : \frac{10 \times 66}{11 \times 5}l. = £12 \text{ cost price per cwt.}$$

$$\therefore \text{cost price of 500 cwt.} = £12 \times 500 = £6000.$$

$$\text{Gain} = \frac{35}{100} \text{ of } \frac{6000}{1} = £1050.$$

$$\therefore \text{selling price of whole} = £6000 + £1050 = £7050.$$

$$\text{Selling price of 120 pockets or 150 cwt.} = £13 \text{ } 4s. \times 150 = £1980.$$

$$\therefore \text{selling price of each remaining 280 pockets or 350 cwt.} \\ = (£7050 - £1980) \div 350 = £14 \text{ } 9s. \text{ } 8\frac{1}{2}d.$$

$$(28) 1\frac{1}{30} : 1 :: 42s. : \frac{20 \times 42}{21}s. = 40s. \text{ cost price per cwt.}$$

\therefore cost price of whole = $40s. \times 300 = £600$.

Selling price of whole = $1\frac{3}{20} \times 600 = £690$.

100 qrs. are sold for $100 \times 42s.$ or $£210$.

\therefore selling price of each remaining 200 qrs. = $(£690 - £210) \div 200$
= $48s.$, or $£2$ 8s.

$$(29) \text{ Cost price of whole} = (£5 \text{ 2s. 8d.} \times 5) + (£2 \text{ 13s. 8d.} \times 2) = £31 \text{ 0s. 8d.}$$

Selling price = $1s. \text{ 7d.} \times 7 \times 112 \text{ lbs.} = £62 \text{ 1s. 4d.}$

\therefore entire gain = $£62 \text{ 1s. 4d.} - £31 \text{ 0s. 8d.} = £31 \text{ 0s. 8d.}$

and gain per cent. = $\frac{100 \times 31\frac{1}{30}}{31\frac{1}{30}} = 100$.

$$(30) \text{ Cost price} = £3 \text{ 5s.} \times 120 = £390.$$

Selling price of whole = $1\frac{3}{20}$ of $390 = £448 \text{ 10s.}$

30 of inferior are sold for $£2\frac{1}{4} \times 30 = £82 \text{ 10s.}$

\therefore selling price of each remaining 90 = $(£448 \text{ 10s.} - £82 \text{ 10s.}) \div 90$
= $£4 \text{ 1s. 4d.}$

EXERCISE LXI., p. 117.

$$(1) £100 \text{ stk.} : £1900 \text{ stk.} :: £89\frac{3}{8} : \frac{1900 \times 715}{100 \times 8}l. = £135\frac{25}{8}$$

$$= £1698 \text{ 2s. 6d.}$$

$$(2) £4 : £495 \text{ 19s. 9d.} :: £90 : \frac{119037 \times 90}{240 \times 4}l. = £357\frac{111}{32}$$

$$= £11159 \text{ 14s. 4}\frac{1}{2}\text{d.}$$

$$(3) \text{ i. } £105 : £2100 :: £100 \text{ stk.} : \frac{2100 \times 100}{105}l. = £2000 \text{ stock.}$$

$$\text{ii. } £100 \text{ stk.} : £2000 \text{ stk.} :: £5 : \frac{2000 \times 5}{100}l. = £100.$$

$$(4) £90 : £3600 :: £3\frac{1}{2} : \frac{3600 \times 7}{90 \times 2}l. = £140 \text{ income.}$$

$$(5) £90 : £3600 :: £\frac{1}{8} : \frac{3600 \times 1}{90 \times 8}l. = £5 \text{ gain.}$$

$$(6) £100 \text{ stk.} : £4500 \text{ stk.} :: £81\frac{3}{4} : \frac{4500 \times 327}{100 \times 4}l. = £1471\frac{5}{4}$$

$$= £3678 \text{ 15s.}$$

$$(7) £100 \text{ stk.} : £800 \text{ stk.} :: £76\frac{1}{8} : \frac{800 \times 609}{100 \times 8}l. = £609.$$

- (8) i. £90 : £1800 :: £100 stk. : $\frac{1800 \times 100}{90}l. = £2000$ stock.
 ii. £90 : £1800 :: £4 : $\frac{1800 \times 4}{90}l. = £80$ income.
- (9) £1000 stk. : £100 stk. :: £900 : $\frac{100 \times 900}{1000} = 90$.
- (10) i. £100 stk. : £3000 stk. :: £96 $\frac{1}{4}$: $\frac{3000 \times 385}{100 \times 4}l. = £577\frac{5}{8}$
 = £2887 10s.
 ii. Gain = £3000 - £2887 10s. = £112 10s.
- (11) £4 : £100 :: £90 : $\frac{100 \times 90}{4}l. = £2250$.
- (12) £98 $\frac{1}{4}$: £3950 :: £100 stk. : $\frac{3950 \times 100 \times 4}{395}l. = £4000$ stk.
- (13) £100 stk. : £2000 stk. :: £85 $\frac{1}{8}$: $\frac{2000 \times 681}{100 \times 8}l. = £240\frac{5}{8}$
 = £1702 10s.
- (14) £100 stk. : £1000 stk. :: £1 : $\frac{1000 \times 1}{100}l. = £10$ loss.
- (15) £100 stk. : £7700 stk. :: £2 $\frac{3}{4}$: $\frac{7700 \times 11}{100 \times 4}l. = £247 = £211$ 15s. 1st income.
 £100 stk. : £7700 stk. :: £70 : $\frac{7700 \times 70}{100}l. = £5390$.
 £98 : £5390 :: £4 $\frac{1}{2}$: $\frac{5390 \times 9}{98 \times 2}l. = £247\frac{5}{8} = £247$ 10s. 2nd income.
 \therefore difference = £247 10s. - £211 15s. = £35 15s.
- (16) i. £75 : £1000 :: £ $\frac{3}{4}$: $\frac{1000 \times 3}{75 \times 4}l. = £10$ gain.
 ii. £1000 : £10 :: £100 : $\frac{10 \times 100}{1000}l. = £1$ gain per cent.
- (17) £100 stk. : £4500 stk. :: £3 : $\frac{4500 \times 3}{100}l. = £135$ 1st income.
 £100 stk. : £4500 stk. :: £72 : $\frac{4500 \times 72}{100}l. = £3240$.
 £90 : £3240 :: £4 : $\frac{3240 \times 4}{90}l. = £144$ 2nd income.
 \therefore difference = £144 - £135 = £9.

$$8) \text{ £}3\frac{1}{2} : \text{£}666 :: \text{£}84 : \frac{666 \times 84 \times 2}{7} \text{ l.} = \text{£}15984.$$

$$9) \text{ £}3 : \text{£}3\frac{1}{2} :: \text{£}80 : \frac{7 \times 80}{3 \times 2} \text{ l.} = \frac{280}{3} = 93\frac{1}{3}.$$

∴ it is more advantageous to invest in the 3 per Cents. at 80.

$$10) \text{ £}12000 : \text{£}10000 :: \text{£}100 : \frac{10000 \times 100}{12000} = \frac{250}{3} = 83\frac{1}{3}.$$

$$11) \text{ £}90 : \text{£}3000 :: \text{£}\frac{1}{2} : \frac{3000 \times 1}{90 \times 2} \text{ l.} = \text{£}\frac{20}{3} = \text{£}16 \text{ 13s. 4d. gain.}$$

$$12) \text{ £}30000 : \text{£}30000 + \text{£}1000 \text{ or } \text{£}31000 :: 90 : \frac{31000 \times 90}{10000} = 93.$$

$$13) \text{ £}72 : \text{£}9000 :: \text{£}3 : \frac{9000 \times 3}{72} \text{ l.} = \text{£}375 \text{ 1st income.}$$

$$\text{£}72 : \text{£}9000 :: \text{£}\frac{1}{2} : \frac{9000 \times 1}{72 \times 2} \text{ l.} = \text{£}\frac{125}{2} = \text{£}62 \text{ 10s. gain.}$$

$$4\frac{1}{2} \text{ per cent.} = \frac{9}{2} \times \frac{1}{100} = \frac{9}{200} \therefore M = (1 \frac{9}{200})^2 \times \text{£}9062\frac{1}{2}.$$

$$M = \frac{809}{200} \times \frac{809}{200} \times \frac{18125}{2} = \frac{\text{£}1266749}{128}.$$

$$\text{£}88 : \frac{\text{£}1266749}{128} :: \text{£}4 : \frac{1266749 \times 4}{88 \times 128} \text{ l.} = \text{£}\frac{115159}{256} = \text{£}449 \text{ 16s. } 9\frac{9}{16} \text{d.}$$

2nd income.

$$\therefore \text{ difference} = \text{£}449 \text{ 16s. } 9\frac{9}{16} \text{d.} - \text{£}375 = \text{£}74 \text{ 16s. } 9\frac{9}{16} \text{d.}$$

$$4) \text{ £}86 : \text{£}8600 :: \text{£}3\frac{1}{2} : \frac{8600 \times 7}{86 \times 2} \text{ l.} = \text{£}350 \text{ 1st income.}$$

$$\text{£}86 : \text{£}8600 :: \text{£}\frac{1}{4} : \frac{8600 \times 1}{86 \times 4} \text{ l.} = \text{£}25 \text{ gain.}$$

$$\text{£}120 : \text{£}8600 + \text{£}25 \text{ or } \text{£}8625 :: \text{£}5 : \frac{8625 \times 5}{120} \text{ l.} = \text{£}\frac{22875}{8} \\ = \text{£}359 \text{ 7s. 6d. 2nd income.}$$

$$\therefore \text{ difference} = \text{£}359 \text{ 7s. 6d.} - \text{£}350 = \text{£}9 \text{ 7s. 6d.}$$

$$5) \text{ £}100 \text{ stk.} : \text{£}1000 \text{ stk.} :: \text{£}3 : \frac{1000 \times 3}{100} \text{ l.} = \text{£}300 \text{ income from investment of £1000.}$$

$\text{£}1000 - \text{£}300 = \text{£}700$ income still to be obtained.

$$\text{£}3\frac{1}{2} : \text{£}700 :: \text{£}100 : \frac{700 \times 100 \times 2}{7} \text{ l.} = \text{£}20000 \text{ sum invested to obtain above income.}$$

$$6) \text{ £}1 : \text{£}50 :: \text{£}100 \text{ stk.} : \frac{50 \times 100}{1} \text{ l.} = \text{£}5000 \text{ stock.}$$

$$7) \text{ £}81 : \text{£}3240 :: \text{£}\frac{1}{4} : \frac{3240 \times 1}{81 \times 4} \text{ l.} = \text{£}10 \text{ gain.}$$

- (28) £100 stk. : £50000 stk. :: £4 : $\frac{50000 \times 4}{100}l. = £2000$ income from investment of £50000.

£9992 - £2000 = £7992 income still to be obtained.

- £4½ : £7992 :: £100 : $\frac{7992 \times 100 \times 2}{9}l. = £177600$ sum invested to obtain above income.

- (29) £80 : £1000 :: £½ : $\frac{1000 \times 1}{80 \times 4}l. = £\frac{15}{8} = £3$ 2s. 6d. gain.

- (30) £5 : £4 :: £100 : $\frac{4 \times 100}{5} = 80$ price of stock.

£80 : £4000 :: £4 : $\frac{4000 \times 4}{80}l. = £200$ income.

- (31) £99 : £96 :: £3300 : $\frac{90 \times 3300}{99}l. = £3200$.

- (32) £4 : £770 :: £90 : $\frac{770 \times 90}{4}l. = £17325$ sum invested.

- (33) £80 : £5050 :: £1¼ : $\frac{5050 \times 5}{80 \times 4}l. = £\frac{2525}{32} = £78$ 18s. 1½d. loss.

- (34) £80 : £4000 :: £100 : $\frac{100 \times 4000}{80}l. = £5000$.

- (35) £2000 : £2000 + £200 or £2200 :: 80 : $\frac{2200 \times 80}{2000} = 88$ price of stock when sold out.

- (36) £3⅓ : £4 :: £81 : $\frac{4 \times 81 \times 8}{27} = 96$.

∴ it is more advantageous to invest in the 4 per Cents at 90.

- (37) £80 : £4000 :: £⅓ : $\frac{4000}{80 \times 8}l. = \frac{5}{4}l. = £6$ 5s. gain.

Interest = $\frac{4006\frac{1}{4} \times 4 \times 4}{100}l. = \frac{16025 \times 4 \times 4}{100 \times 4}l. = £641$.

∴ entire gain = £641 + £6 5s. = £647 5s.

£4000 : £100 :: £647½ : $\frac{100 \times 2589}{4000 \times 4}l. = £\frac{2589}{160} = £16$ 3s. 7½d. gain per cent.

- (38) £4½ : £2000 :: £90¼ : $\frac{2000 \times 36 \times 4}{19 \times 4}l. = £38000$.

9) £84 : £3500 :: £3½ : $\frac{3500 \times 7}{84 \times 2} \text{ l.} = £275 = £145 \text{ 16s. 8d.}$ one year's dividend.

∴ half-year's dividend = £145 16s. 8d. + 2 = £72 18s. 4½d.

£416 13s. 4d. - £72 18s. 4d. = £343 15s.

As £343 15s. is to be gained it must be sold out at a greater price.

∴ £3500 : £3500 + £343 15s. or £3843 15s. :: £84 : $\frac{15375 \times 84}{3500 \times 4} = \frac{399}{4} = 92\frac{1}{4}$.

10) £2 : £45 :: £100 : $\frac{45 \times 100}{2} \text{ l.} = £2250$.

1) £3 : £66⅔ :: £81 : $\frac{200 \times 81}{3 \times 3} \text{ l.} = £1800$.

2) $\frac{4}{240} = \frac{1}{60}$ of your income. $\frac{1}{60}$ of £3 = $\frac{1}{20}$ income tax on £3.

∴ $3 - \frac{1}{20} = 2\frac{19}{20}$.

£3½ : £2½ :: £100 : $\frac{59 \times 2 \times 100}{7 \times 20} = \frac{590}{7} = 84\frac{2}{7}$.

EXERCISE LXII., p. 121.

1) 3 + 2 + 1 = 6.

Share of 1st = $\frac{3}{6}$ of $\frac{30000}{1} = £15000$.

„ „ 2nd = $\frac{2}{6}$ of $\frac{30000}{1} = £10000$.

„ „ 3rd = $\frac{1}{6}$ of $\frac{30000}{1} = £5000$.

2) $\frac{1}{5}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7} = \frac{140, 105, 84, 70, 60}{420}$ and $140 + 105 + 84 + 70 + 60 = 459$.

1st receives $\frac{140}{459}$ of $£\frac{19431}{18} = £\frac{4445}{12} = £370 \text{ 8s. 4d.}$

2nd „ $\frac{105}{459}$ of $£\frac{19431}{18} = £\frac{4445}{16} = £277 \text{ 16s. 3d.}$

3rd „ $\frac{84}{459}$ of $£\frac{19431}{18} = £\frac{889}{4} = £222 \text{ 5s.}$

4th „ $\frac{70}{459}$ of $£\frac{19431}{18} = £\frac{4445}{24} = £185 \text{ 4s. 2d.}$

5th „ $\frac{60}{459}$ of $£\frac{19431}{18} = £\frac{635}{4} = £158 \text{ 15s.}$

3) * $\frac{2 \times 18}{24} \text{ oz.} = 1 \text{ 10 0}$ oz. dwts. grs.

$\frac{3 \times 15}{24} \text{ oz.} = 1 \text{ 17 12}$

$\frac{2 \times 12}{24} \text{ oz.} = 1 \text{ 0 0}$

4 7 12 fine gold.

Fineness of mass = $(2 \times 18 + 3 \times 15 + 2 \times 12 \text{ carats}) + (2 + 3 + 2 \text{ oz.})$
= $105 + 7 = 112 \text{ carats.}$

* Pure or virgin gold is 24 carats fine.

(4) $22 + 13 + 17 = 52.$

Rent of 1st = $\frac{22}{52}$ of $\frac{130}{1} = £55.$

" " 2nd = $\frac{13}{52}$ of $\frac{130}{1} = £32$ 10s.

" " 3rd = $\frac{17}{52}$ of $\frac{130}{1} = £42$ 10s.

(5) 1st received $\frac{2500}{10000}$ of $\frac{9420}{1} = £2355.$

2nd " $\frac{2000}{10000}$ of $\frac{9420}{1} = £1884.$

3rd " $\frac{1800}{10000}$ of $\frac{9420}{1} = £1695$ 12s.

4th " $\frac{1600}{10000}$ of $\frac{9420}{1} = £1413.$

5th " $\frac{1800}{10000}$ of $\frac{9420}{1} = £1224$ 12s.

6th " $\frac{820}{10000}$ of $\frac{9420}{1} = £847$ 16s.

(6) A's capital for 12 months = $2000 \times 12 = £24000.$

B's " " 8 " = $2800 \times 8 = £22400.$

C's " " 6 " = $1800 \times 6 = £10800.$

$£24000 + £22400 + £10800 = £57200.$

∴ A's share = $\frac{24000}{57200}$ of $\frac{1859}{1} = £780.$

B's " = $\frac{22400}{57200}$ of $\frac{1859}{1} = £728.$

C's " = $\frac{10800}{57200}$ of $\frac{1859}{1} = £351.$

(7) A's profit for 10 months = $11 \times 10 = 110.$

B's " " 15 " = $13 \times 15 = 195.$

A's " " remaining 14 months = $\{11 - (\frac{1}{5} \text{ of } 11)\} \times 14 = 1$

B's " " " 9 " = $\{13 - (\frac{1}{13} \text{ of } 13)\} \times 9 = 1$

A's capital for 2 years = $110 + 136\frac{2}{3} = 246\frac{2}{3}.$

B's " " " = $195 + 108 = 303.$

∴ A's capital : B's capital :: $246\frac{2}{3} : 303$ or $2222 : 2727.$

A's share = $\frac{2222}{2989}$ of $\frac{1813}{1} = £814.$

B's " = $\frac{2727}{2989}$ of $\frac{1813}{1} = £999.$

(8) $30 \times 6 = 180.$ $20 \times 10 = 200.$ ∴ $180 + 200 = 380.$

Rent paid by 1st = $\frac{180}{380}$ of $\frac{32}{1} = £18.$

" " 2nd = $\frac{200}{380}$ of $\frac{32}{1} = £20.$

Profit of 1st = $\frac{180}{380}$ of $\frac{57}{1} = £27.$

" " 2nd = $\frac{200}{380}$ of $\frac{57}{1} = £30.$

(9)* Pure silver = $\frac{37}{40}$ of $\frac{2240}{1}$ lbs. = 2072 lbs.

Copper = $\frac{3}{40}$ of $\frac{2240}{1}$ lbs. = 168 lbs.

As 1 lb. or 5760 grs. : 1 ton or (7000×2240) grs. ∴ $£3\frac{3}{10}$

: $\frac{7000 \times 2240 \times 33}{10 \times 5760}$ l. = $£26950\frac{5}{8} = £8983$ 6s. 8d. value of 1 t

silver.

1 half-crown, shilling, fourpenny piece, and threepenny
= 49 pence.

∴ $(\frac{26950}{8} \times 240 \text{ d.}) + 49 \text{ d.} = 44000.$

* 1 ton = 2240 lbs.; and 7000 grs. Troy = 1 lb. Av.

$$0) 75 + 10 + 15 = 100.$$

Nitre = $\frac{75}{100}$ of $\frac{20}{1}$ cwt. = 15 cwt.

Sulphur = $\frac{10}{100}$ of $\frac{20}{1}$ cwt. = 2 cwt.

Charcoal = $\frac{15}{100}$ of $\frac{20}{1}$ cwt. = 3 cwt.

$$1) \frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{10 + 5 + 4}{20} = \frac{19}{20}.$$

$\therefore 1 - \frac{19}{20}$ or $\frac{1}{20}$ of cast contains $9\frac{1}{2}$ gallons of brandy.

As $\frac{1}{20}$ equals $9\frac{1}{2}$ gallons $\therefore 9\frac{1}{2} \times 20 = 190$ gallons or total number mixed.

$\frac{1}{2}$ of $\frac{190}{1} = 95$ gallons. $\frac{1}{4}$ of $\frac{190}{1} = 47\frac{1}{2}$ gallons. $\frac{1}{8}$ of $\frac{190}{1} = 23\frac{3}{4}$ gallons.

$$2) 9 + 10 + 11 = 30. \quad 15A. \quad 3R. \quad 30P. = 2550 \text{ pls.}$$

Size of gardens in 1st set = $\frac{9}{30}$ of $\frac{2550}{1} \times \frac{1}{20} = 38\frac{1}{2}$ pls.

" " 2nd " = $\frac{10}{30}$ of $\frac{2550}{1} \times \frac{1}{20} = 42\frac{1}{2}$ pls.

" " 3rd " = $\frac{11}{30}$ of $\frac{2550}{1} \times \frac{1}{20} = 46\frac{1}{2}$ pls.

$$3) \frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{63 + 45 + 35}{315} = \frac{143}{315}.$$

\therefore number of lbs. of different kind = $1 - \frac{143}{315}$ or 172 lbs.

" " mixed = $63 + 45 + 35 + 172 = 315$ lbs., which cost £47 5s.

Cost of 1st quantity = $\frac{1}{2}$ of £47 $\frac{1}{4}$ = £9 9s.

" 2nd " = $\frac{1}{4}$ of £47 $\frac{1}{4}$ = £6 15s.

" 3rd " = $\frac{1}{8}$ of £47 $\frac{1}{4}$ = £5 5s.

" 4th " = $\frac{1}{315}$ of £47 $\frac{1}{4}$ = £25 16s.

Selling price = 315 lbs. \times 3s. 8d. = £57 15s.

\therefore entire gain = £57 15s. - £47 5s. = £10 10s.

and gain per cent. = $\frac{£10\frac{1}{2} \times 100}{£47\frac{1}{4}} = \frac{100 \times 21 \times 4}{189 \times 2} = \frac{200}{9} = 22\frac{2}{9}\%$.

$$4) A = 30 \times 22 = 660; B = 25 \times 24 = 600; C = 45 \times 18 = 810.$$

$$660 + 600 + 810 = 2070.$$

$\therefore A$ paid $\frac{660}{2070}$ of £23 = £7 6s. 8d.

B " $\frac{600}{2070}$ of £23 = £6 13s. 4d.

C " $\frac{810}{2070}$ of £23 = £9.

$$15) 4 + \frac{5}{8} + \frac{1}{4} = \frac{48 + 10 + 3}{12} \text{ and } 48 + 10 + 3 = 61.$$

7 tons 11 cwt. 3 qrs. 23 lbs. = 17019 lbs.

\therefore weight of copper = $\frac{48}{61}$ of $\frac{17019}{1}$ = 13392 lbs. = 5 tons 19 cwt. 2 qrs. 8 lbs.

" " tin = $\frac{10}{61}$ of $\frac{17019}{1}$ = 2790 lbs. = 1 ton 4 cwt. 3 qrs. 18 lbs.

" " zinc = $\frac{3}{61}$ of $\frac{17019}{1}$ = 837 lbs. = 7 cwt. 1 qr. 25 lbs.

7 tons 11 cwt. 3 qrs. 23 lbs. @ £7 9s. 4d. per cwt.

		£	s.	d.
2 qrs.	$\frac{1}{2}$	7	9	4
			151	
		1127	9	4
1 qr.	$\frac{1}{2}$	3	14	8
14 lbs.	$\frac{1}{2}$	1	17	4
7 lbs.	$\frac{1}{2}$		18	8
2 lbs.	$\frac{1}{2}$		9	4
			2	8
£1134 12s. 0d. cost.				

(16) A's profit for 3 months = $5 \times 3 = 15$.

B's " 9 " = $7 \times 9 = 63$.

C's " 8 " = $9 \times 8 = 72$.

A's profit for 9 months = $\{5 + (\frac{1}{2} \text{ of } 5)\} 9 = 56\frac{1}{2}$.

B's " 3 " = $\{7 + (\frac{1}{3} \text{ of } 7)\} 3 = 28$.

C's " 4 " = $\{9 + (\frac{1}{2} \text{ of } 9)\} 4 = 54$.

A's capital for 1 year = $15 + 56\frac{1}{2} = 71\frac{1}{2}$.

B's " " = $63 + 28 = 91$.

C's " " = $72 + 54 = 126$.

$71\frac{1}{2} + 89 + 126 = (\text{clearing of fractions}) 285 + 364 + 504 = 1153$.

A's share = $\frac{285}{1153}$ of $\frac{3459}{1} = £855$.

B's " = $\frac{364}{1153}$ of $\frac{3459}{1} = £1092$.

C's " = $\frac{504}{1153}$ of $\frac{3459}{1} = £1512$.

(17) A can do $\frac{1}{30}$, B $\frac{1}{28}$, and C $\frac{1}{24}$ in 1 hour.

∴ A, B, and C together do $\frac{1}{30} + \frac{1}{28} + \frac{1}{24} = \frac{93}{840}$ in 1 hour.

A and B do $\frac{5}{30} + \frac{5}{30} + \frac{5}{28}$ or $\frac{43}{84}$ of the work before joined by C.

∴ $1 - \frac{43}{84}$ or $\frac{41}{84}$ of the work remains to be done by A, B, and C together

∴ $\frac{93}{840} : \frac{41}{84} :: 1 \text{ hr.} : \frac{41 \times 840}{84 \times 93} = \frac{410}{93} \text{ hrs.} = 4 \text{ hrs. } 24\frac{16}{31} \text{ min.}$

(18) $\frac{2}{3} + \frac{1}{6} + \frac{1}{6} = \frac{16 + 4 + 3}{24} = \frac{23}{24}$.

∴ $1 - \frac{23}{24}$ or $\frac{1}{24}$ of the trees remaining are cherry.

∴ total number of trees = 24×10 or 240.

Number of apple trees = $\frac{2}{3}$ of $\frac{240}{1} = 160$.

" pear " = $\frac{1}{6}$ of $\frac{240}{1} = 40$.

" plum " = $\frac{1}{6}$ of $\frac{240}{1} = 40$.

$$(9) \frac{1}{3} + \frac{1}{4} + \frac{1}{5} = \frac{20 + 15 + 12}{60}, \text{ and } 20 + 15 + 12 = 47.$$

$$9\text{A. } 2\text{R. } 31\text{P.} = 1551\text{P.}$$

$$\text{No. of acres cut by } A = \frac{20}{47} \text{ of } \frac{1551}{1} = 660\text{P.} = 4\text{A. } 0\text{R. } 20\text{P.}$$

$$\text{'' '' } B = \frac{15}{47} \text{ of } \frac{1551}{1} = 495\text{P.} = 3\text{A. } 0\text{R. } 15\text{P.}$$

$$\text{'' '' } C = \frac{12}{47} \text{ of } \frac{1551}{1} = 396\text{P.} = 2\text{A. } 1\text{R. } 36\text{P.}$$

$$£2 \text{ } 10\text{s. } 11\text{d.} = 611\text{d.}$$

$$\therefore \text{ wages earned by } A = \frac{20}{47} \text{ of } \frac{611}{1} = 260\text{d.} = £1 \text{ } 1\text{s. } 8\text{d.}$$

$$\text{'' '' } B = \frac{15}{47} \text{ of } \frac{611}{1} = 195\text{d.} = £0 \text{ } 16\text{s. } 3\text{d.}$$

$$\text{'' '' } C = \frac{12}{47} \text{ of } \frac{611}{1} = 156\text{d.} = £0 \text{ } 13\text{s. } 0\text{d.}$$

$$(9) \text{ Value of pure gold 24 carats fine is } £4 \text{ } 4\text{s. } 4\frac{5}{11}\text{d. per oz.}$$

£	s.	d.	£	s.	d.	carats	carats
∴ 4	4	11 $\frac{5}{11}$	: 1	11	10 $\frac{13}{14}$	:: 24	: 9
4	4	11 $\frac{5}{11}$	: 2	2	5 $\frac{8}{11}$	:: 24	: 12
4	4	11 $\frac{5}{11}$	: 2	13	1 $\frac{7}{4}$	:: 24	: 15
4	4	11 $\frac{5}{11}$	: 3	3	8 $\frac{13}{22}$	:: 25	: 18

$$\text{oz. dwts. grs. oz. carats}$$

$$3 \text{ } 10 \text{ } 15 = \frac{113}{32} \times \frac{9}{1} = \frac{1017}{32}$$

$$2 \text{ } 3 \text{ } 17 = \frac{1049}{480} \times \frac{12}{1} = \frac{1249}{40}$$

$$1 \text{ } 12 \text{ } 10 = \frac{389}{240} \times \frac{15}{1} = \frac{389}{16}$$

$$2 \text{ } 17 \text{ } 15 = \frac{461}{160} \times \frac{18}{1} = \frac{4149}{80}$$

$$\frac{1017}{32} + \frac{1249}{40} + \frac{389}{16} + \frac{461}{160} = \frac{327}{32} \text{ oz.} \times \frac{15}{1} = \frac{4905}{32} \text{ carats} = \text{the mass 15 carats fine.}$$

$$\frac{1017}{32} + \frac{1249}{40} + \frac{389}{16} + \frac{4149}{80} = \frac{21469}{160} = \text{fineness of mass bought.}$$

$$\therefore \text{ number of carats the one exceeds the other} = \frac{4905}{32} - \frac{21469}{160} = \frac{191}{16}.$$

$$\therefore \frac{191}{16} + 24 = \frac{191}{10} \times \frac{1}{24} \times \frac{20}{1} = \frac{191}{12} \text{ dwts.} = 15 \text{ dwts. } 22 \text{ grs.}$$

$$1\text{st, as } \frac{113}{32} : \frac{327}{32}, \text{ or as } 113 : 327.$$

$$2\text{nd, as } \frac{1049}{480} : \frac{327}{32}, \text{ or as } 1049 : 4905.$$

$$3\text{rd, as } \frac{389}{240} : \frac{327}{32}, \text{ or as } 778 : 4905.$$

$$4\text{th, as } \frac{461}{160} : \frac{327}{32}, \text{ or as } 1383 : 4905.$$

EXERCISE LXIII., p. 126.

$$1) \text{ Value of 1 franc} = 240\text{d.} + 25\cdot45 = 9\cdot43\text{d., \&c.}$$

$$2) 9\frac{1}{2}\text{d.} : £102 \text{ } 16\text{s. } 9\text{d.} :: 1 \text{ fr.} : \frac{24681 \times 1 \times 2}{19} \text{ fr.} = 2598 \text{ francs.}$$

$$3) \text{ No. of dollars} = £750 \times 4\cdot87 = 3652\cdot5$$

(4)

 $\text{£}1 = 25\cdot4$ francs.

19 fr. = 1 Spanish pistola.

1000 S. p. = $x\text{£}$.

$\therefore x = \frac{19 \times 1000}{25\cdot4} = \text{£}748 \text{ Os. } 7\frac{71}{137}d.$ value of 1000 pistoles thr
France.

1000 pistoles = $\frac{1000}{1} \times \frac{1}{4} = \text{£}750$. \therefore gain = $\text{£}750 - \text{£}748 \text{ Os. } 7\frac{71}{137}d. = \text{£}1 \text{ 19s. } 4\frac{56}{137}d.$

(5)

 $\text{£}1 = 25\cdot25$ francs.

4·25 fr. = 1 rouble.

6200 roubles = $x\text{£}$.

$\therefore x = \frac{4\cdot25 \times 6200}{25\cdot25} = \text{£}1043 \text{ 11s. } 3\frac{45}{101}d.$

Advantage by paying through Paris = $\text{£}1043 \text{ 11s. } 3\frac{45}{101}d. -$
= $\text{£}43 \text{ 11s. } 3\frac{45}{101}d.$

(6)

1 ducat = 11 roubles.

3 roubles = 12 francs.

25 francs = $\text{£}1$. $x\text{£} = 50$ ducats.

$\therefore x = \frac{11 \times 12 \times 50}{3 \times 25} = \text{£}88.$

EXERCISE LXIV., p. 127.

(1) $27|04$ (52)

25
 $\overline{102) 204}$
 204
 $\overline{\quad}$
 ...

(2) $1|71|61$ (131)

1
 $\overline{23) 71}$
 69
 $\overline{\quad}$
 261) 261
 261
 $\overline{\quad}$
 ...

(3) $2|01|64$ (142)

1
 $\overline{24) 101}$
 96
 $\overline{\quad}$
 282) 564
 564
 $\overline{\quad}$
 ...

(4) $5|38|24$ (232)

4
 $\overline{43) 138}$
 129
 $\overline{\quad}$
 462) 924
 924
 $\overline{\quad}$
 ...

$$\begin{array}{r} 5) \quad 12\overline{)81}64 \text{ (358)} \\ \underline{9} \\ 65) 381 \\ \underline{325} \\ 708) 5664 \\ \underline{5664} \\ \dots \end{array}$$

$$\begin{array}{r} (6) \quad 34\overline{)10}56 \text{ (584)} \\ \underline{25} \\ 108) 910 \\ \underline{864} \\ 1164) 4656 \\ \underline{4656} \\ \dots \end{array}$$

$$\begin{array}{r}) \quad 88\overline{)36}00 \text{ (940)} \\ \underline{81} \\ 184) 736 \\ \underline{736} \\ \dots \end{array}$$

$$\begin{array}{r} (8) \quad 94\overline{)67}29 \text{ (973)} \\ \underline{81} \\ 187) 1367 \\ \underline{1309} \\ 1943) 5829 \\ \underline{5829} \\ \dots \end{array}$$

$$\begin{array}{r}) \quad \sqrt{1\frac{385}{2116}} = \sqrt{\frac{3401}{2116}} = \frac{49}{46} = 1\frac{3}{46}. \\ \quad 24\overline{)01}49 \\ \quad \underline{16} \\ 89) 801 \\ \quad \underline{801} \\ \quad \dots \end{array}$$

$$\begin{array}{r} 21\overline{)16}46 \\ \underline{16} \\ 86) 516 \\ \quad \underline{516} \\ \quad \dots \end{array}$$

$$\begin{array}{r}) \quad \sqrt{38\frac{144}{441}} = \sqrt{\frac{16900}{441}} = \frac{130}{21} + 6\frac{4}{21}. \\ \quad 1\overline{)69}00 \text{ (130)} \\ \quad \underline{1} \\ 23) 69 \\ \quad \underline{69} \\ \quad \dots \end{array}$$

$$\begin{array}{r} 4\overline{)41}21 \\ \underline{4} \\ 41) 41 \\ \quad \underline{41} \\ \quad \dots \end{array}$$

$$\begin{array}{r} 1) \quad 1\overline{)06}09 \text{ (10.3)} \\ \underline{1} \\ 203) 609 \\ \quad \underline{609} \\ \quad \dots \end{array}$$

$$\begin{array}{r} (12) \quad 3\overline{)45}96 \text{ (1.86)} \\ \underline{1} \\ 28) 245 \\ \underline{224} \\ 366) 2196 \\ \underline{2196} \\ \dots \end{array}$$

(13) $12 \cdot | 53 | 16 \text{ (3} \cdot 54$

$$\begin{array}{r} 9 \\ \hline 65) \ 353 \\ \underline{325} \\ 704) \ 2816 \\ \underline{2816} \\ \dots \end{array}$$

(14) $1 | 26 \cdot | 11 | 29 \text{ (11} \cdot 23$

$$\begin{array}{r} 1 \\ \hline 21) \ 26 \\ \underline{21} \\ 222) \ 511 \\ \underline{444} \\ 2243) \ 6729 \\ \underline{6729} \\ \dots \end{array}$$

(15) $7 \cdot | 47 | 47 | 56 \text{ (2} \cdot 734$

$$\begin{array}{r} 4 \\ \hline 47) \ 347 \\ \underline{320} \\ 543) \ 1847 \\ \underline{1629} \\ 5464) \ 21856 \\ \underline{21856} \\ \dots \end{array}$$

(16) $1 | 23 | 67 \cdot | 66 | 41 \text{ (111} \cdot 21$

$$\begin{array}{r} 1 \\ \hline 21) \ 23 \\ \underline{21} \\ 221) \ 267 \\ \underline{221} \\ 2222) \ 4666 \\ \underline{4444} \\ 22241) \ 22241 \\ \underline{22241} \\ \dots \end{array}$$

(17) $\sqrt{1 \frac{24425}{326041}} = \sqrt{\frac{356464}{326041}} = \frac{592}{571} = 1 \frac{21}{571}.$

$$\begin{array}{r} 35 | 04 | 64 \text{ (592} \\ \underline{25} \\ 109) \ 1004 \\ \underline{981} \\ 1182) \ 2364 \\ \underline{2364} \\ \dots \end{array}$$

$$\begin{array}{r} 32 | 60 | 41 \text{ (571} \\ \underline{25} \\ 107) \ 760 \\ \underline{749} \\ 1141) \ 1141 \\ \underline{1141} \\ \dots \end{array}$$

(18) $\sqrt{5 \frac{52121}{32041}} = \sqrt{\frac{172326}{32041}} = \frac{427}{179} = 2 \frac{69}{179}.$

$$\begin{array}{r} 18 | 23 | 29 \text{ (427} \\ \underline{16} \\ 82) \ 223 \\ \underline{164} \\ 847) \ 5929 \\ \underline{5929} \\ \dots \end{array}$$

$$\begin{array}{r} 3 | 20 | 41 \text{ (179} \\ \underline{1} \\ 27) \ 220 \\ \underline{189} \\ 349) \ 3141 \\ \underline{3141} \\ \dots \end{array}$$

$$1) \sqrt{944\frac{13}{225}} = \sqrt{\frac{212521}{225}} = \frac{461}{15} = 30\frac{11}{15}.$$

$$\begin{array}{r} 21 \overline{) 25} 21 \text{ (461)} \\ \underline{16} \\ 86) \overline{) 525} \\ \underline{516} \\ 921) \overline{) 921} \\ \underline{921} \\ \dots \end{array}$$

$$\begin{array}{r} 2 \overline{) 25} \text{ (15)} \\ \underline{1} \\ 25) \overline{) 125} \\ \underline{125} \\ \dots \end{array}$$

$$1) \quad 4 \overline{) 55} \overline{) 72} \overline{) 10} \overline{) 07} \overline{) 75} \overline{) 01} \overline{) 29} \text{ (21347623)}$$

$$\begin{array}{r} 4 \\ \hline 41) \overline{) 55} \\ \underline{41} \end{array}$$

$$423) \overline{) 1472} \\ \underline{1269}$$

$$4264) \overline{) 20310} \\ \underline{17056}$$

$$42687) \overline{) 325407} \\ \underline{298809}$$

$$426946) \overline{) 2659875} \\ \underline{2561676}$$

$$4269522) \overline{) 9819901} \\ \underline{8539044}$$

$$42695243) \overline{) 128085729} \\ \underline{128085729} \\ \dots \dots \dots$$

$$\begin{array}{r} (21) \quad 4 \overline{) 00} \overline{) 80} \overline{) 04} \text{ (20.02)} \\ \hline 4 \\ \hline 4002) \overline{) 8004} \\ \underline{8004} \\ \dots \end{array}$$

$$2) \sqrt{283\frac{9}{289}} = \sqrt{\frac{81799}{289}} = \frac{286}{17} = 16\frac{14}{17}.$$

$$\begin{array}{r} 8 \overline{) 17} \overline{) 96} \text{ (286)} \\ \hline 4 \\ \hline 48) \overline{) 417} \\ \underline{384} \\ 566) \overline{) 3396} \\ \underline{3396} \\ \dots \end{array}$$

$$\begin{array}{r} 2 \overline{) 89} \text{ (17)} \\ \hline 1 \\ \hline 27) \overline{) 189} \\ \underline{189} \\ \dots \end{array}$$

$$(23) \sqrt{854179} = \sqrt{\frac{854179}{441}} = \frac{923}{21} = 1821$$

$$\begin{array}{r} 29\ 48\ 49\ (543 \\ 25 \\ \hline 164\ 448 \\ 416 \\ \hline 1063) 5249 \\ 5249 \\ \hline \dots \end{array}$$

$$\begin{array}{r} 8|41\ (29 \\ 4 \\ \hline 49) 441 \\ 441 \\ \hline \dots \end{array}$$

$$(24) \sqrt{142171} = \sqrt{\frac{142171}{121}} = \frac{377}{11} = 1116$$

$$\begin{array}{r} 4\ 12\ 09\ (203 \\ 4 \\ \hline 403) 1209 \\ 1209 \\ \hline \dots \end{array}$$

$$\begin{array}{r} 2|89\ (17 \\ 1 \\ \hline 27) 189 \\ 189 \\ \hline \dots \end{array}$$

$$(25) \sqrt{531001} = \sqrt{\frac{531001}{3409}} = \frac{729}{57} = 730$$

$$\begin{array}{r} 50\ 26\ 81\ (709 \\ 49 \\ \hline 1409) 12681 \\ 12681 \\ \hline \dots \end{array}$$

$$\begin{array}{r} 94|09\ (97 \\ 81 \\ \hline 187) 1309 \\ 1309 \\ \hline \dots \end{array}$$

$$(26) \quad 89|31|30\ (945055 \&c. \quad (27) \quad 4|23|56|70\ (205807 \&c.$$

$$\begin{array}{r} 81 \\ \hline 184) 831 \\ 736 \\ \hline 1885) 9530 \\ 9425 \\ \hline 189005) 1050000 \\ 945025 \\ \hline 1890105) 10497500 \\ 9450525 \\ \hline 1046975 \end{array}$$

$$\begin{array}{r} 4 \\ \hline 405) 2356 \\ 2025 \\ \hline 4108) 33170 \\ 32864 \\ \hline 411607) 3080000 \\ 2881249 \\ \hline 178751 \end{array}$$

28)	73|24|56 (85.5836 &c.	(29)	21|93|45|67|45 (4683.43 &c.
	<u>64</u>		<u>16</u>
	165) 924		86) 593
	<u>825</u>		<u>516</u>
	1705) 9956		928) 7745
	<u>8525</u>		<u>7424</u>
	17108) 143100		9363) 32167
	<u>136864</u>		<u>28080</u>
	171163) 623600		93664) 407845
	<u>513489</u>		<u>374656</u>
	1711666) 11011100		936683) 3318900
	<u>10269996</u>		<u>2810049</u>
	741104		508851

10)	92|34|56|30 (96.0966 &c.
	<u>81</u>
	186) 1134
	<u>1116</u>
	19209) 185630
	<u>172881</u>
	192186) 1274900
	<u>1153116</u>
	1921926) 12178400
	<u>11531556</u>
	646844

31)	2|85|61 (169	1|69 (13
	<u>1</u>	<u>1</u>
	26) 185	23) 69
	<u>156</u>	<u>69</u>
	329) 2961	..
	<u>2961</u>	
	

(32) $70\overline{)72}81\ (841$

$$\begin{array}{r}
 64 \\
 \hline
 164\)\ 672 \\
 \underline{656} \\
 1681\)\ 1681 \\
 \underline{1681} \\
 \dots
 \end{array}$$

$8\overline{)41}\ (29$

$$\begin{array}{r}
 4 \\
 \hline
 49\)\ 441 \\
 \underline{441} \\
 \dots
 \end{array}$$

(33) $5\overline{)76}48\overline{)01}\ (2401$

$$\begin{array}{r}
 4 \\
 \hline
 44\)\ 176 \\
 \underline{176} \\
 4801\)\ 4801 \\
 \underline{4801} \\
 \dots
 \end{array}$$

$24\overline{)01}\ (49$

$$\begin{array}{r}
 16 \\
 \hline
 89\)\ 801 \\
 \underline{801} \\
 \dots \\
 \sqrt{49} = 7.
 \end{array}$$

(34) $43\overline{)04}67\overline{)21}\ (6561$

$$\begin{array}{r}
 36 \\
 \hline
 125\)\ 704 \\
 \underline{625} \\
 1306\)\ 7967 \\
 \underline{7836} \\
 13121\)\ 13121 \\
 \underline{13121} \\
 \dots
 \end{array}$$

$65\overline{)61}\ (81$

$$\begin{array}{r}
 64 \\
 \hline
 161\)\ 161 \\
 \underline{161} \\
 \dots \\
 \sqrt{89} = 9.
 \end{array}$$

EXERCISE LXV., p. 129.

(1) $2\overline{)197}\ (13$

1

$$\begin{array}{r}
 1^2 \times 300 = 300 \\
 1 \times 3 \times 30 = 90 \\
 1^2 = 1 \\
 \hline
 399 \quad 1197
 \end{array}$$

(2) $74\overline{)088}\ (42$

64

$$\begin{array}{r}
 4^2 \times 300 = 4800 \\
 4 \times 2 \times 30 = 240 \\
 2^2 = 4 \\
 \hline
 5044 \quad 10088
 \end{array}$$

<p>(3) 140|608 (52</p> <div style="margin-left: 100px;">125</div> <hr style="width: 100%;"/> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> $5^2 \times 300 = 7500$ $5 \times 2 \times 30 = 300$ $2^2 = 4$ </div> <div style="width: 50%; text-align: right;"> 15608 <hr style="width: 100%;"/> $7804 \quad 15608$ </div> </div>	<p>(4) 1|030|301 (101</p> <div style="margin-left: 100px;">1</div> <hr style="width: 100%;"/> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> $1^2 \times 300 = 300$ $1 \times 30 = 30$ 330 <hr style="width: 100%;"/> $10^2 \times 300 = 30000$ $10 \times 1 \times 30 = 300$ $1^2 = 1$ </div> <div style="width: 50%; text-align: right;"> 30301 <hr style="width: 100%;"/> 30301 </div> </div>
--	--

(5) 1|906|624 (124

1

$1^2 \times 300 = 300$
 $1 \times 2 \times 30 = 60$
 $2^2 = 4$

906

 $364 \quad 728$

$12^2 \times 300 = 43200$
 $12 \times 4 \times 30 = 1440$
 $4^2 = 16$

178624

 $44656 \quad 178624$

(6) 4|492|125 (165

1

$1^2 \times 300 = 300$
 $1 \times 6 \times 30 = 180$
 $6^2 = 36$

3492

 $516 \quad 3096$

$16^2 \times 300 = 76800$
 $16 \times 5 \times 30 = 2400$
 $5^2 = 25$

396125

 $79225 \quad 396125$

(7)

$$\begin{array}{r|l}
 7|762|392 \text{ (108)} & \\
 1 & \\
 \hline
 1^2 \times 300 = 300 & 6762 \\
 1 \times 9 \times 30 = 270 & \\
 9^2 = 81 & \\
 \hline
 651 & 5859 \\
 \hline
 19^2 \times 300 = 108300 & 903392 \\
 19 \times 8 \times 30 = 4560 & \\
 8^2 = 64 & \\
 \hline
 112924 & 903392
 \end{array}$$

(8)

$$\begin{array}{r|l}
 12|326|391 \text{ (231)} & \\
 8 & \\
 \hline
 2^2 \times 300 = 1200 & 4326 \\
 2 \times 3 \times 30 = 180 & \\
 3^2 = 9 & \\
 \hline
 1389 & 4167 \\
 \hline
 23^2 \times 300 = 158700 & 159391 \\
 23 \times 1 \times 30 = 690 & \\
 1^2 = 1 & \\
 \hline
 159391 & 159391
 \end{array}$$

(9)

$$\begin{array}{r|l}
 36|594|368 \text{ (332)} & \\
 27 & \\
 \hline
 3^2 \times 300 = 2700 & 9594 \\
 3 \times 3 \times 30 = 270 & \\
 3^2 = 9 & \\
 \hline
 2979 & 8937 \\
 \hline
 33^2 \times 300 = 328700 & 657368 \\
 33 \times 2 \times 30 = 1980 & \\
 2^2 = 4 & \\
 \hline
 328684 & 657368
 \end{array}$$

CUBE ROOT.

179

	187|149|248 (572
	125
$5^2 \times 300 = 7500$	62149
$5 \times 7 \times 30 = 1050$	
$7^2 = 49$	
8599	60193
$57^2 \times 300 = 974700$	1956248
$57 \times 2 \times 30 = 3420$	
$2^2 = 4$	
978124	1956248

	806|954|491 (931
	729
$9^2 \times 300 = 24300$	77954
$9 \times 3 \times 30 = 810$	
$3^2 = 9$	
25119	75357
$93^2 \times 300 = 2594700$	2597491
$93 \times 1 \times 30 = 2790$	
$1^2 = 1$	
2597491	2597491

2)

	991|026|973 (997
	729
$9^2 \times 300 = 24300$	262026
$9 \times 9 \times 30 = 2430$	
$9^2 = 81$	
26811	241299
$99^2 \times 300 = 2940300$	20727973
$99 \times 7 \times 30 = 20790$	
$7^2 = 49$	
2961139	20727973

(13)

20·|123|648 (2·72
8

$2^2 \times 300 = 1200$	12123
$2 \times 7 \times 30 = 420$	
$7^2 = 49$	
1669	11683
$27^2 \times 300 = 218700$	440648
$27 \times 2 \times 30 = 1620$	
$2^2 = 4$	
220324	440648

(14)

34|012·|224 (32·4
27

$3^2 \times 300 = 2700$	7012
$3 \times 2 \times 30 = 180$	
$2^2 = 4$	
2884	5768
$32^2 \times 300 = 307200$	1244224
$32 \times 4 \times 30 = 3840$	
$4^2 = 16$	
311056	1244224

(15)

39·|651|821 (3·41
27

$3^2 \times 300 = 2700$	12651
$3 \times 4 \times 30 = 360$	
$4^2 = 16$	
3076	12304
$34^2 \times 300 = 346800$	347821
$34 \times 1 \times 30 = 1020$	
$1^2 = 1$	
347821	347821

(16)

203|297|472 (58·8
125

$5^2 \times 300 = 7500$	78297
$5 \times 8 \times 30 = 1200$	
$8^2 = 64$	
8764	70112
$58^2 \times 300 = 1009200$	8185472
$51 \times 8 \times 30 = 13920$	
$8^2 = 64$	
1023184	8185472

(17)

233|744|896 (61·6
216

$6^2 \times 300 = 10800$	17744
$6 \times 1 \times 30 = 180$	
$1^2 = 1$	
10981	10981
$61^2 \times 300 = 1116300$	6763896
$61 \times 6 \times 30 = 10980$	
$6^2 = 36$	
1127316	6763896

(18)

618|470|208 (8·52
512

$8^2 \times 300 = 19200$	106470
$8 \times 5 \times 30 = 1200$	
$5^2 = 25$	
20425	102125
$85^2 \times 300 = 2167500$	4345208
$85 \times 2 \times 30 = 5100$	
$2^2 = 4$	
2172604	4345208

(19)

	663|054|848 (87·2
	512
$8^2 \times 300 = 19200$	151054
$8 \times 7 \times 30 = 1680$	
$7^2 = 49$	
20929	146503
$87^2 \times 300 = 2270700$	4551848
$17 \times 30 \times 2 = 5220$	
$2^2 = 4$	
2275924	4551848

(20)

	771·|095|213 (9·17
	729
$9^2 \times 300 = 24300$	42095
$9 \times 1 \times 30 = 270$	
$1^2 = 1$	
24571	24571
$91^2 \times 300 = 2484300$	17524213
$91 \times 7 \times 30 = 19110$	
$7^2 = 49$	
2503459	17524213

(21) $\sqrt[3]{2809\frac{329}{729}} = \sqrt{\frac{904 \times 383}{729}} = \frac{137}{9} = 14\frac{1}{9}$.

	2|048|383 (127
	1
$1^2 \times 300 = 300$	1048
$1 \times 2 \times 30 = 60$	
$2^2 = 4$	
364	728
$12^2 \times 300 = 43200$	320383
$12 \times 7 \times 30 = 2520$	
$7^2 = 49$	
45769	520383

$$(22) \sqrt[3]{977\overline{148877}} = \sqrt[3]{145531\overline{576}} = \frac{526}{53} = 9\frac{48}{53}.$$

145|531|576 (526

125

$5^2 \times 300 = 7500$	20531
$5 \times 2 \times 30 = 300$	
$2^2 = 4$	
<u>7804</u>	15608
$52^2 \times 300 = 811200$	4923576
$52 \times 6 \times 30 = 9360$	
$6^2 = 36$	
<u>820596</u>	4923576

148|877 (53

125

$5^2 \times 300 = 7500$	23877
$5 \times 3 \times 30 = 450$	
$3^2 = 9$	
<u>7959</u>	23877

$$(23) \sqrt[3]{11222\overline{4133}} = \sqrt[3]{854508\overline{27}} = \frac{403}{18} = 22\frac{7}{18}.$$

65|450|827 (403

64

$4^2 \times 300 = 4800$	1450827
$4 \times 30 = 120$	
<u>4920</u>	
$40^2 \times 300 = 480000$	
$40 \times 3 \times 30 = 3600$	
$3^2 = 9$	
<u>483609</u>	1450827

5|832 (18

1

$1^2 \times 300 = 300$	4832
$1 \times 8 \times 30 = 240$	
$8^2 = 64$	
<u>604</u>	4832

(24)

955|671·|625 (98·5
729

$9^2 \times 300 = 24300$	226671
$9 \times 8 \times 30 = 2160$	
$8^2 = 64$	
<u>26524</u>	<u>212192</u>
$98^2 \times 300 = 2881200$	14479625
$98 \times 5 \times 30 = 14700$	
$5^2 = 25$	
<u>2895925</u>	<u>14479625</u>

(25)

982·|107|784 (9·94
729

$9^2 \times 300 = 24300$	253107
$9 \times 9 \times 30 = 2430$	
$9^2 = 81$	
<u>26811</u>	<u>241299</u>
$99^2 \times 300 = 2940300$	11808784
$99 \times 4 \times 30 = 11880$	
$4^2 = 16$	
<u>2952196</u>	<u>11808784</u>

(26)

822|656|953 (937
729

$9^2 \times 300 = 24300$	93656
$9 \times 3 \times 30 = 810$	
$3^2 = 9$	
<u>25119</u>	<u>75357</u>
$93^2 \times 300 = 2594700$	18299953
$93 \times 7 \times 30 = 19530$	
$7^2 = 49$	
<u>2614279</u>	<u>18299953</u>

(27)

	440|711|081 (76·1
	<u>343</u>
$7^2 \times 300 = 14700$	97711
$7 \times 6 \times 30 = 1260$	
$6^2 = 36$	
<u>15996</u>	95976
$76^2 \times 300 = 1732800$	1735081
$76 \times 1 \times 30 = 2280$	
$1^2 = 1$	
<u>1735081</u>	<u>1735081</u>

(28)

	575|930|368 (8·32
	<u>512</u>
$8^2 \times 300 = 19200$	63930
$8 \times 3 \times 30 = 720$	
$3^2 = 9$	
<u>19929</u>	59787
$83^2 \times 300 = 2066700$	4143368
$83 \times 2 \times 30 = 4980$	
$2^2 = 4$	
<u>2071684</u>	<u>4143368</u>

(29)

	633|839|779 (85·9
	<u>512</u>
$8^2 \times 300 = 19200$	121839
$8 \times 5 \times 30 = 1200$	
$5^2 = 25$	
<u>20425</u>	102125
$85^2 \times 300 = 2167500$	19714779
$85 \times 9 \times 30 = 22950$	
$9^2 = 81$	
<u>2190531</u>	<u>19714779</u>

(30)

	363|994|344 (714
	<u>343</u>
$7^2 \times 300 = 14700$	<u>20994</u>
$7 \times 1 \times 30 = 210$	
$1^2 = 1$	
<u>14911</u>	<u>14911</u>
$71^2 \times 300 = 1512300$	<u>6083344</u>
$71 \times 4 \times 30 = 8520$	
$4^2 = 16$	
<u>1520836</u>	<u>6083344</u>

(31)

	134|217|728 (512
	<u>125</u>
$5^2 \times 300 = 7500$	<u>9217</u>
$5 \times 1 \times 30 = 150$	
$1^2 = 1$	
<u>7651</u>	<u>7651</u>
$51^2 \times 300 = 780300$	<u>1566728</u>
$51 \times 2 \times 30 = 3060$	
$2^2 = 4$	
<u>783364</u>	<u>1566728</u>

$$\sqrt{512} = 8.$$

(32)

	387|420|489 (729
	<u>343</u>
$7^2 \times 300 = 14700$	<u>44420</u>
$7 \times 2 \times 30 = 420$	
$2^2 = 4$	
<u>15124</u>	<u>30248</u>
$72^2 \times 300 = 1555200$	<u>14172489</u>
$72 \times 9 \times 30 = 19440$	
$9^2 = 81$	
<u>1574721</u>	<u>14172489</u>

$$\sqrt{729} = 9.$$

EXERCISE LXVI., p. 130.

$$1) 1 \text{ oz. Ap.} : 1 \text{ ton} :: \frac{4}{5} \text{ l.} : \frac{1 \times 20 \times 112 \times 7000 \text{ grs.} \times 4}{1 \times 8 \times 3 \times 20 \text{ grs.} \times 5} \text{ l.} = \frac{78400}{3} \text{ l.}$$

$$= £26133 \text{ 6s. } 8\text{d.}$$

2) As each man has three times as much as a woman \therefore 3 men and 5 women are equal to $(3 \times 3) + 5$ or 14 women.

\therefore each woman receives £756 13s. 5d. $\div 14$, or £54 0s. 11½d.

\therefore 5 women receive £54 0s. 11½d. $\times 5 = £270$ 4s. 9½d., and 9 women or 3 men receive £54 0s. 11½d. $\times 9 = £486$ 8s. 7½d.

$$3) \text{ i. } 916321) \frac{1832642}{2748963} = \frac{2}{3}.$$

$$\text{ii. } (7\frac{1}{2} + 3\frac{1}{4} + \frac{5}{8}) - (3\frac{1}{4} + 7\frac{1}{10} + \frac{3}{8}) = 11\frac{3}{8} - 10\frac{29}{40} = \frac{26}{40} = \frac{13}{20}$$

$$4) \quad 464 \text{ sq. yds. } 5 \text{ sq. ft. } 112 \text{ sq. in.}$$

$$\begin{array}{r} 9 \\ \hline 4181 \\ 144 \\ \hline 16836 \\ 16724 \\ \hline 4181 \end{array}$$

$$60 \overline{) 21} 76 \text{ in. } (776 \text{ in.} = 21 \text{ yds. } 1 \text{ ft. } 8 \text{ in. one side.}$$

$$49$$

$$147) 1121$$

$$1029$$

$$1546) 9276$$

$$9276$$

$$....$$

$$50 \overline{) 70} 86 \overline{) 41} (7 \cdot 121$$

$$49$$

$$141) 170$$

$$141$$

$$1422) 2986$$

$$2844$$

$$14241) 14241$$

$$14241$$

$$.....$$

		938·|313|739 (9·79 729
$9^2 \times 300 =$	24300	209313
$9 \times 7 \times 30 =$	1890	
$7^2 =$	49	
	26239	183673
$97^2 \times 300 =$	2822700	25640739
$97 \times 9 \times 30 =$	26190	
$9^2 =$	81	
	2848971	25640739

$$(5) 19 \cdot 125 + 12 \cdot 68 + 6 \cdot 55 + 10 \cdot 5 + 428571 + 20 \cdot 75 + 1 \cdot 3 = 71 \cdot 333571.$$

$$\therefore \text{average} = 71 \cdot 333571 \div 7 = 10 \cdot 190510142857.$$

$$(6) 5 \text{ per cent.} = \frac{1}{20} \therefore M = (1 \frac{1}{20})^3 \times £365 \text{ 14s. } 3 \frac{3}{4}d.$$

$$M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{614400}{7} = \frac{508032}{7}d. = £423 \text{ 7s. } 2 \frac{2}{5}d.$$

$$(7) 8 \frac{3}{4} \text{ ft. : 10 mls.} :: 1 \text{ revolution : } \frac{10 \times 1760 \times 3 \text{ ft.} \times 1}{8 \frac{3}{4}}$$

$$= \frac{10 \times 1760 \times 3 \times 4}{35} = \frac{42240}{7} = 6034 \frac{2}{7} \text{ times.}$$

$$(8) \text{Expense} = \left(\frac{20 \times 30}{9} \text{ yds.} \times 3 \frac{1}{2} \text{ s.} \right) = \frac{20 \times 30}{9} \times \frac{15}{4} = 250 \text{ s., or } £12 \text{ 10s.}$$

$$\text{Number of bricks} = (20 \text{ ft.} \times 30 \text{ ft.}) \div \left(\frac{3}{4} \text{ ft.} \times \frac{9}{24} \text{ ft.} \right) = \frac{800}{1} \times \frac{4}{3} \times \frac{24}{9} \\ = \frac{6400}{3} = 2133 \frac{1}{3} \text{ bricks.}$$

$$(9) \text{Number of square yards} = \frac{£62 \text{ 10s. } 6 \frac{1}{4}d.}{4d.} = \frac{60025}{4 \times 4} \text{ yds.}$$

$$\therefore \text{length of each side} = \sqrt{\frac{60025}{16}} = \frac{245}{4} \text{ yds.} = 61 \text{ yds. } 0 \text{ ft. } 9 \text{ in.}$$

$$(10) \text{Length to be cut off} = 2 \frac{1}{4} \text{ c. ft.} + \left(\frac{9}{48} \text{ ft.} \times \frac{9}{12} \text{ ft.} \right) = \frac{9}{4} \times \frac{48}{9} \times \frac{12}{9} = 16 \text{ feet.}$$

$$(11) 1 : 1 \frac{1}{10} :: 30 \text{ s.} : \frac{11 \times 30}{10} \text{ s.} = 33 \text{ s. selling price.}$$

$$\therefore \text{No. of gallons of brandy} = \frac{60 \times 18}{33} = \frac{360}{11} = 32 \frac{8}{11} \text{ gals.}$$

$$(12) \text{Cost price} = \frac{1}{8} \text{ of } 15 \text{ s.} = 12 \text{ s. } 6d.$$

$$\therefore \text{gain} = 18 \text{ s.} - 12 \text{ s. } 6d. = 5 \text{ s. } 6d.$$

$$12 \frac{1}{2} : 100 :: 5 \frac{1}{2} : \frac{100 \times 11 \times 2}{25 \times 2} = 44 \text{ gain per cent.}$$

$$(13) \text{Area of 4 sides} = (6 \frac{1}{4} + 2 \frac{2}{3}) \times 2 \times 3 \frac{1}{2} = \frac{107}{12} \times \frac{2}{1} \times \frac{7}{2} = \frac{49}{2} \text{ sq. ft.}$$

$$\text{Area of bottom} = 6 \frac{1}{4} \times 2 \frac{2}{3} = \frac{25}{4} \times \frac{8}{3} = \frac{50}{3} \text{ sq. ft.}$$

$$\therefore \text{whole area to be lined} = \frac{749}{12} + \frac{50}{3} = \frac{949}{12} \text{ sq. ft.}$$

$$\therefore \text{number of lbs.} = \frac{949}{12} \div 8 = \frac{1898}{3}.$$

$$\text{Cost of lining} = \frac{1898}{3} \times \frac{1}{112} \times \frac{171}{8} = \frac{47451}{448} \text{ s.} = £10 \text{ 11s. } 9 \frac{37}{112}d.$$

$$14) 1\frac{1}{2} \text{ E. ells} : \frac{7}{8} \times \frac{3}{2} \text{ E. ells} :: \frac{5}{8} \times 21s. : \frac{7 \times 8 \times 3 \times 35}{5 \times 9 \times 3 \times 2} s. = \frac{105}{9} s. = 21\frac{1}{3} s. \\ = £1 \text{ 1s. } 9\frac{1}{3} d.$$

$$5) \text{ No. of yds.} = 538 \times 12 = 6456 \text{ yards.}$$

$$\text{Reduction of 10 per cent. upon } \frac{3}{8} \text{ of the quantity} = (\frac{3}{8} \text{ of } 6456) \\ \times (1 - \frac{1}{10} \text{ or } \frac{9}{10} \text{ of } £1\frac{5}{8}) = £5665 \text{ 2s. } 9\frac{3}{4} d.$$

$$\text{A reduction of } 7\frac{1}{2} \text{ per cent. upon the remaining } \frac{3}{8} = (\frac{3}{8} \text{ of } 6456) \\ \times (1 - \frac{7\frac{1}{2}}{100} \text{ or } \frac{37}{40} \text{ of } £1\frac{5}{8}) = £3881 \text{ 13s. } 4\frac{1}{2} d.$$

$$\therefore \text{entire cost} = £5665 \text{ 2s. } 9\frac{3}{4} d. + £3881 \text{ 13s. } 4\frac{1}{2} d. = £9546 \text{ 16s. } 2\frac{3}{4} d.$$

$$1) 1\frac{1}{2} : 1 :: 18s. : \frac{8 \times 18}{9} s. = 16s. \text{ cost price.}$$

$$\therefore \text{gain} = 20s. - 16s. = 4s.$$

$$16s. : 100 :: 4s. : \frac{100 \times 4}{16} = 25 \text{ gain per cent.}$$

$$) \text{ His private property enables him to pay } 13s. 9\frac{1}{2} d. - 5s. 4\frac{1}{4} d., \text{ or } \\ 8s. 5\frac{1}{4} d., \text{ in the } £.$$

$$\therefore 8s. 5\frac{1}{4} d. : £858 \text{ 18s. } 9d. :: £1 : \frac{206145 \times 1 \times 4}{405} l. = £2036.$$

$$3) 9 \times 4 = 36, A's \text{ profit for 4 months.}$$

$$10 \times 4 = 40, B's \text{ profit for 4 months.}$$

$$\{9 - (\frac{1}{2} \times \frac{2}{3})\} \times 8 = 36, A's \text{ profit for 8 months.}$$

$$\{10 - (\frac{1}{3} \times \frac{10}{3})\} \times 8 = \frac{160}{3}, B's \text{ profit for 8 months.}$$

$$36 + 36 = 72, A's \text{ capital for 1 year.}$$

$$40 + 53\frac{1}{3} = 93\frac{1}{3}, B's \text{ capital for 1 year.}$$

$$\therefore A's \text{ capital} : B's \text{ capital as } 72 : 93\frac{1}{3} \text{ or } 216 : 280.$$

$$\therefore A's \text{ proportion} = \frac{216}{496} \text{ of } £3844 = £1674.$$

$$B's \quad \quad \quad = \frac{280}{496} \text{ of } £3844 = £2170.$$

$$9) 84 : 100 :: 3\frac{1}{2} : \frac{100 \times 7}{84 \times 2} = \frac{25}{6} = 4\frac{1}{6}.$$

$$0) \text{ Number that left} = \frac{3}{28} + \frac{3}{28} = \frac{13}{14} \text{ or } \frac{1}{6}.$$

$$\therefore \text{the remaining } \frac{5}{6} \text{ are equal to 390 boys.}$$

$$\therefore \text{original number} = \frac{6}{5} \times 390 = 468.$$

$$1) A \text{ can do } \frac{1}{15} \text{ of the work in one hour.}$$

$$B \text{ can do } \frac{1}{12} \text{ of the work in one hour.}$$

$$C \text{ can do } \frac{1}{10} \text{ of the work in one hour.}$$

$$\therefore A, B, \text{ and } C \text{ together do } \frac{1}{15} + \frac{1}{12} + \frac{1}{10} = \frac{15}{60} \text{ or } \frac{1}{4} \text{ in one hour.}$$

$$A \text{ and } B \text{ do } \frac{3}{15} + \frac{3}{15} + \frac{3}{15} = \frac{30}{60} \text{ or } \frac{13}{20} \text{ of the work before joined by } C.$$

$$\therefore 1 - \frac{13}{20} = \frac{7}{20} \text{ of the work remains to be done.}$$

$$\text{As } A, B, \text{ and } C \text{ do } \frac{1}{4} \text{ in one hour, they will do } \frac{7}{20} \text{ of the work in } \frac{7}{20} \times 4 \\ = 1\frac{1}{2} \text{ hr., or } 1 \text{ hr. } 24 \text{ min.}$$

- (22) A man rows 7 miles in $2\frac{1}{2}$ hours, or 3 miles per hour, against the stream.

\therefore in still water he will row $3 + 3\frac{1}{2}$ or $6\frac{1}{2}$ miles per hour.

And with the stream $6\frac{1}{2}$ mls. + $3\frac{1}{2}$ mls. or 10 miles per hour.

\therefore time in rowing 15 miles with stream = $\frac{15}{10}$ hr., or 1 hr. 30 min.

- (23) 4d. in the £ = $\frac{4}{240}$ or $\frac{1}{60}$ of income.

Then $1 - \frac{1}{60}$ or $\frac{59}{60} : 1 :: £649 : \frac{649 \times 60}{59} £ = £660$ gross income.

$3\frac{1}{4} l. : £660 :: £94 : \frac{660 \times 94 \times 2}{7} l. = \frac{124080}{7} l. = £17725$ 14s. $3\frac{1}{4}d.$

amount invested.

- (24) £1 15s. $\times 12 = £21$ = one year's discount.

If £100 represents a gain of £25, what will represent a gain of £21?

$£25 : £21 :: £100 : \frac{21 \times 100}{25} l. = £84.$

$\therefore £560 + £84 = £644$ annual income.

- (25) $£46\frac{29}{40} : £1869 :: £3\frac{3}{10} : \frac{33 \times 1869 \times 40}{10 \times 1869} l. = £132$ price of 1 lb. of

silver, supposing gold and silver to be of the same weight.

But the specific gravity of gold : silver as $19\frac{1}{2} : 10\frac{1}{2}$.

\therefore value of bar of silver = $\frac{132 \times 10\frac{1}{2}}{19\frac{1}{2}} l. = £\frac{224}{13} = £71$ 1s. $6\frac{6}{13}d.$

- (26) An income tax of 6d. in the £ = $\frac{6}{240}$ or $\frac{1}{40}$ of your income; $\frac{1}{40}$ of £4 = $£\frac{1}{10}$, the income tax on £4; therefore the net income received from £100 stock = $£4 - \frac{1}{10}$, or $£3\frac{9}{10}$.

$4\frac{1}{2} : 3\frac{9}{10} :: 100 : \frac{39 \times 100 \times 2}{9 \times 10} = \frac{260}{3} = 86\frac{2}{3}.$

- (27) $7 + 5 + 4 = 16.$

\therefore each man receives $\frac{7}{16}$ of £113 2s. = £49 9s. $7\frac{1}{2}d.$

„ lad „ $\frac{5}{16}$ of £113 2s. = £35 6s. $10\frac{1}{2}d.$

„ woman „ $\frac{4}{16}$ of £113 2s. = £28 5s. 6d.

No. of pints drunk per day = $(12 \times 3) + (8 \times 2) + (8 \times 1\frac{1}{2}) = 64$ pints.

\therefore cost of beer = $\frac{64}{144}$ bar. $\times 29 \times 31\frac{1}{2} s. = £10$ 3s.

- (28) An income tax of 4d. in the £ = $\frac{4}{240}$ or $\frac{1}{60}$ of your income; $\frac{1}{60}$ of £3 = $£\frac{1}{20}$, the income tax on £3; therefore net income received from £100 stock = $£3 - \frac{1}{20} = £2\frac{19}{20}$.

$4 : 2\frac{19}{20} :: 100 : \frac{59 \times 100}{20 \times 4} = \frac{295}{4} = 73\frac{3}{4}.$

- (29) 10 cwt. 1 qr. 4 lbs. = 1152 lbs., or 1152×7000 grains.
 \therefore as 1 lb. or 5760 grs. : 1152 \times 7000 grs. :: $46\frac{12}{15}$ sovs.
 $\therefore \frac{1152 \times 7000 \times 1869}{5760 \times 40}$ sovs. = 65415 sovereigns.
 \therefore weight = 65415 sovs. + $46\frac{12}{15}$ sovs. = 1400 lbs. Troy.
- (30) $46\frac{12}{15}$ sovereigns weigh 1 lb. or 5760 grs. Troy.
 \therefore weight of 1 sov. (Troy) = $5760 + 46\frac{12}{15} = 5$ dwts. $3\frac{171}{625}$ grs. Troy.
 Secondly, 65415 sovereigns weigh 1152 lbs. Av.
 \therefore weight of 1 sov. (Av.) = $\frac{1152 \times 16 \times 16}{65415}$ drs.; $\frac{88804}{11805}$ drs.
 = $4\frac{11804}{11805}$ drams Av.
- (31) Cost price of 120 lbs. = (20 lbs. \times 2s. 6d.) + (40 lbs. \times 2s.)
 + (60 lbs. \times 1s. 9d.) = £2 10s. + £4 + £5 5s. = £11 15s.
 Selling price of 120 lbs. = 2s. $11\frac{1}{4}$ d. \times 120 lbs. = £17 12s. 6d.
 \therefore entire gain = £17 12s. 6d. - £11 15s. = £5 17s. 6d.
 £11 15s. : 100 :: £5 17s. 6d. : 50 gain per cent.
- (32) $2\frac{1}{4}$ per cent. = $\frac{5}{200}$ or $\frac{1}{40}$. $\therefore M = (1\frac{1}{40})^3 \times £9666\frac{2}{3}$.
 $M = \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40} \times \frac{29000}{3} = £\frac{9197089}{7680} = £10670$ 3s. $9\frac{23}{32}$ d.
 \therefore C.I. = £10670 3s. $9\frac{23}{32}$ d. - £9666 13s. 4d. = £1003 10s. $5\frac{29}{32}$ d.
- (33) An income tax of 4d. in the £ = $\frac{1}{240}$ or $\frac{1}{60}$ of your income; $\frac{1}{60}$ of
 $£4\frac{2}{7} = £\frac{1}{14}$, the income tax on $£4\frac{2}{7}$; the net income received
 from £100 stock = $£4\frac{2}{7} - \frac{1}{14} = £\frac{59}{14}$.
 $£5 : £\frac{59}{14} :: 100 : \frac{59 \times 100}{5 \times 14} = \frac{590}{7} = 84\frac{2}{7}$.
- (34) Cost of 36 - 6 gals., or 30 gallons, = £1 10s.
 \therefore cost price per gallon = $\frac{20}{30}$ s. = 1 shilling.
 Selling price to gain 25 p.c. = $\frac{1 \times 125}{100}$ s. = 1s. 3d.
- (35) 5 per cent. = $\frac{5}{100}$ or $\frac{1}{20}$ of income $\therefore \frac{19}{20}$ is left.
 $\frac{19}{20} : 1 :: £4047 : \frac{20 \times 4047}{19} l. = £4260$ gross income.
- (36) A certain number of men half finish a piece of work in 30 days.
 \therefore there remains 30 days' work to be done.
 As 20 more than the original number finish the remainder in 15
 days, or half the time,
 \therefore 20 was the number first employed.

- (37) Cost price of 100 lbs. = $(1\frac{1}{3}s. \times 80) + (\frac{2}{3}s. \times 20) = 106\frac{2}{3}s. + 13\frac{1}{3}s. = 120s.$
 Selling price = $1\frac{1}{2}s. \times 100 = 150s.$

\therefore entire gain = $150 - 120 = 30s.$

and gain per cent. = $\frac{30 \times 100}{120} = 25.$

- (38) 1 oz. : 2 lbs. 9 oz. $18\frac{1}{2}$ dwts. $\therefore 5\frac{1}{3}s. : \frac{542\frac{1}{2}}{8}$ dwts. $\times 5\frac{1}{3}s.$
 20 dwts.

$$= \frac{5425 \times 16}{20 \times 8 \times 3} s. = \frac{1085}{3} s. = £9 \text{ 0s. } 10d.$$

- (39) A and B can do $\frac{1}{8}$ in 1 day.

A and C can do $\frac{1}{10}$ in 1 day.

B and C can do $\frac{1}{12}$ in 1 day.

$\therefore 2A, B,$ and C do $\frac{1}{8} + \frac{1}{10} + \frac{1}{12} = \frac{37}{120}$ in 1 day.

$\therefore A, B,$ and C do $\frac{37}{120} \div 2 = \frac{37}{240}$ in 1 day, or finish the work in $\frac{240}{37}$ or $6\frac{18}{37}$ days.

Work done by C in 1 day = $\frac{37}{240} - \frac{1}{8} = \frac{7}{240}$.

\therefore time it takes C alone = $\frac{240}{7}$ or $34\frac{2}{7}$ days.

Work done by B in 1 day = $\frac{37}{240} - \frac{1}{10} = \frac{13}{240}$.

\therefore time it takes B alone = $\frac{240}{13}$ or $18\frac{6}{13}$ days.

Work done by A in 1 day = $\frac{37}{240} - \frac{1}{12} = \frac{17}{240}$.

\therefore time it takes A alone = $\frac{240}{17}$ or $14\frac{2}{17}$ days.

- (40) As $1\frac{1}{8} : 1 :: 4\frac{1}{2}s. : \frac{9 \times 8}{9 \times 2} s. = 4s.$ cost price per yard.

Cost price of 100 yds. = $100 \times 4s. = £20.$

Gain of 20 per cent. = $\frac{1}{5}$ of $\frac{20}{1} = £4.$

\therefore selling price of whole = $£20 + £4 = £24.$

40 yds. are sold for $4s. 6d. \times 40 = £9.$

\therefore price per yard of remainder = $(£24 - £9) \div 60 = £15 \div 60$, or $5s.$

- | | cwt. | qrs. | lbs. | oz. | drs. |
|--|------|------|------|-----|-----------------|
| (41) $\cdot 375$ or $\frac{3}{8}$ of $\frac{8}{7}$ tons | = 8 | 2 | 8 | 0 | 0 |
| $4\cdot 714285$ cwt. = $4\frac{5}{7}$ cwt. | = 4 | 2 | 24 | 0 | 0 |
| $\cdot 571428$ of $\frac{5}{4}$ qrs. = $\frac{4}{7}$ of $\frac{5}{4} = \frac{5}{7}$ qrs. | = 0 | 0 | 20 | 0 | 0 |
| $\cdot 428571$ of 18 lbs. = $\frac{3}{7}$ of $\frac{18}{1} = \frac{54}{7}$ lbs. | = 0 | 0 | 7 | 11 | $6\frac{5}{7}$ |
| $\frac{1}{3}$ of $\frac{1}{2}$ of $\frac{8}{7}$ of $\frac{5}{1} = \frac{5}{7}$ oz. | = | | | | $11\frac{3}{7}$ |
| \therefore sum = | 13 | 2 | 3 | 12 | $2\frac{2}{7}$ |

- (42) As work is done in the ratio of 1, 2, and 3 \therefore 1 man is equal to 2 women or 3 boys.

Then 10 men, 8 women, 6 boys, are equal to 16 men; and 6 men, 6 women, 6 boys, are equal to 11 men.

\therefore as 11 men : 16 men $\left. \begin{array}{l} 1 \\ : 3 \end{array} \right\} :: 33 \text{ dys. Then } \frac{16 \times 3 \times 33}{11} = 144 \text{ dys.}$

(43) Income tax at 4d. in the £ = $\frac{1}{12}$ of £14s = £12 3s. 4d.

$$4d. : £12 \text{ 3s. 4d.} :: £1 : \frac{2920d. \times 1}{4d.} l. = £730 \text{ income.}$$

	£	s.	d.
Rent of house =	146	0	0
Poor, paving, and church rates =	41	19	6
Income tax =	12	3	4
∴ rent and taxes =	200	2	10

(44) $5 + 3 + 1 = 9$.

No. of apple trees = $\frac{5}{9}$ of $117 = 65$.

„ pear „ = $\frac{3}{9}$ of $117 = 39$.

„ plum „ = $\frac{1}{9}$ of $117 = 13$.

Selling price of apple trees = $\frac{65}{1} \times 4\frac{1}{2}s. = £14 \text{ 12s. 6d.}$

„ „ pear „ = $(\frac{13}{1} \times 5s.) + (\frac{26}{1} \times 4s.) = £8 \text{ 9s.}$

„ „ plum „ = $(10 \times £1\frac{1}{4}) + (3 \times 3s.) = £1 \text{ 14s.}$

∴ selling price of whole = £14 12s. 6d. + £8 9s. + £1 14s., or
£24 15s. 6d.

$$\text{As } 1\frac{1}{2} : 1 :: £24 \text{ 15s. 6d.} : \frac{5946 \times 5}{6} d. = 4955d. = £20 \text{ 12s. 11d.}$$

(45) Weight of 32 cubic inches of silver = $32 \times 10.5 = 336$.

Weight of 100 cubic inches of platinum = $100 \times 21.5 = 2150$.

∴ weight of silver and platinum = $336 + 2150 = 2486$.

$$\therefore 127\frac{12}{35} : 2486 :: 1 : \frac{2486 \times 39}{4972} = \frac{39}{2} = 19.5.$$

EXERCISE LXVII., p. 133.

(1)	£	s.	d.
	432	11	7 $\frac{1}{2}$
	17	16	4
	3427	2	11 $\frac{1}{2}$
	10121	19	3 $\frac{3}{4}$
	13999	10	2 $\frac{1}{2}$

(2) Share of each = £55 6s. 10 $\frac{1}{2}$ d. + 35 = £1 11s. 7 $\frac{1}{2}$ d.

(3) $\frac{3}{4}$ yd. : 3×1760 yds. ∴ 1 step : $\frac{3 \times 1760 \times 4}{3} = 7040$ steps.

<p style="text-align: center;">lbs.</p> $ \begin{array}{r} (4) \ 28 \left\{ \begin{array}{l} 4) \ 5813456 \\ 7) \ 1453364 \ 0 \\ 4) \ 207623 \ 3 \end{array} \right. \left. \begin{array}{l} \\ \\ \end{array} \right\} 12 \text{ lbs.} \\ 2,0) \ 5190,5 \ 3 \text{ qrs.} \\ \hline 2595 \text{ tons } 5 \text{ cwt.} \\ 3 \text{ qrs. } 12 \text{ lbs.} \end{array} $	$ \begin{array}{r} 4 \text{ lbs. } 11 \text{ oz. } 16 \text{ dwts. } 22 \text{ grs.} \\ 12 \\ \hline 59 \text{ oz.} \\ 20 \\ \hline 1196 \text{ dwts.} \\ 24 \\ \hline 4806 \\ 2392 \\ \hline 28726 \text{ grains.} \end{array} $
--	---

(5) Yearly income = £7 × 52 = £364.

„ expenditure = £64 5s. × 4 = £257.

∴ he saves in 4 years (£364 - £257) × 4 = £107 × 4 = £428.

(6) 1 cwt. : 319 cwt. 3 qrs. 16 lbs. ∴ £2 12s. 6d. : $\frac{35828 \text{ lbs.} \times 63^{\text{th}}}{112 \text{ lbs.}}$
 $= \frac{403065}{2} \text{ d.} = £839 \text{ 14s. } 4\frac{1}{2} \text{ d.}$

(7) Number of rupees = $\frac{£88 \text{ 4s. } 5\frac{1}{2} \text{ d.}}{1 \text{ s. } 11\frac{1}{2} \text{ d.}} = \frac{42347}{47} = 901.$

$$\begin{array}{r}
 £ \quad s. \\
 2857 \ 15 \\
 \hline
 20
 \end{array}$$

(8) Number of people by shilling admission = 57155

∴ number to be admitted on a half-crown day = $\frac{57155 \text{ s.}}{2\frac{1}{2}} = 22862$

<p>(9) •</p>	<p>2 cwt. $\frac{1}{10}$</p>	<p>$\frac{1}{10}$</p>	$ \begin{array}{r} £ \quad s. \quad d. \\ 73 \quad 6 \quad 8 \\ 5 \\ \hline 366 \quad 13 \quad 4 \\ 5 \\ \hline 1833 \quad 6 \quad 8 \\ 7 \quad 6 \quad 8 \\ 3 \quad 13 \quad 4 \\ 9 \quad 2 \\ \hline £1844 \ 15s. 10d. \end{array} $
	<p>1 cwt. $\frac{1}{2}$</p>	<p>$\frac{1}{2}$</p>	
	<p>14 lbs. $\frac{1}{8}$</p>	<p>$\frac{1}{8}$</p>	

(10) 3 cwt. 3 qrs. 12 lbs. : 6 lbs. ∴ £9 : $\frac{6 \times 9}{432} \text{ l.} = £\frac{1}{8}$, or 2s. 6d.

$$£4586 \text{ 8s.} : 3822 \text{ g.} :: £1 : \frac{3822 \times 21\text{s.} \times 1}{91728\text{s.}} \text{ l.} = £7\text{s.} \text{ or } 17\text{s. } 6\text{d.}$$

$$18 \text{ sec.} : 1 \text{ hr.} :: \frac{1}{4} \text{ mile} : \frac{60 \times 60 \text{ sec.}}{18 \text{ sec.} \times 4} \text{ mls.} = 50 \text{ miles.}$$

$$1 - \frac{7}{240} \text{ or } \frac{233}{240} \text{ of your income represents } £1632 \text{ 18s. } 10\text{d.}$$

$$\frac{233}{240} : 1 :: £1632, 18\text{s. } 10\text{d.} : \frac{391906 \times 240}{240 \times 233} \text{ l.} = £1682 \text{ gross income.}$$

$$35\frac{1}{2} \text{ lbs.} : 2 \text{ cwt. } 0 \text{ qr. } 51 \text{ lbs.} :: £1 \text{ 2s. } 2\frac{1}{2}\text{d.} : \frac{275 \text{ lbs.} \times 1065\text{f.}}{35\frac{1}{2} \text{ lbs.}}$$

$$= \frac{275 \times 1065 \times 2}{71} \text{ f.} = 8250\text{f.} = £8 \text{ 11s. } 10\frac{1}{2}\text{d.}$$

$$\frac{3}{7} : \frac{11}{24} :: £450 : \frac{11 \times 450 \times 7}{3 \times 24} \text{ l.} = £1925 = £481 \text{ 5s.}$$

$$\frac{3}{7} \text{ of } \frac{5}{8} \text{ of } \frac{33}{4} \text{ of } \frac{2}{3} \text{ of } \frac{7}{18} \text{ of } \frac{15}{1} = \frac{375}{36} = 7\frac{13}{36}.$$

$$\frac{2}{11} \text{ of } 27\frac{1}{2} + \frac{3}{16} \text{ of } 21\frac{1}{4} = \frac{2}{11} \times \frac{55}{2} \times \frac{10}{8} \times \frac{4}{85} = \frac{49}{85}.$$

$\begin{array}{r} \cdot 00179) \cdot 086457 (48 \cdot 3 \\ \underline{716} \\ 1485 \\ \underline{1432} \\ 537 \\ \underline{537} \\ \dots \end{array}$	$\begin{array}{r} \cdot 682) \cdot 032054 (047 \\ \underline{2728} \\ 4774 \\ \underline{4774} \\ \dots \end{array}$
--	--

i. $1|32|77|95|29 (115 \cdot 23$

$$\begin{array}{r} 1 \\ \hline 21) 32 \\ \underline{21} \\ 225) 1177 \\ \underline{1125} \\ 2302) 5295 \\ \underline{4604} \\ 23043) 69129 \\ \underline{69129} \\ \dots \end{array}$$

ii. $1|23|45|43|21 (111 \cdot 11$

$$\begin{array}{r} 1 \\ \hline 21) 23 \\ \underline{21} \\ 221) 245 \\ \underline{221} \\ 2221) 2443 \\ \underline{2221} \\ 22221) 22221 \\ \underline{22221} \\ \dots \end{array}$$

iii. $8 \overline{) 10}$ (2·84604 &c.

$$\begin{array}{r}
 4 \\
 48 \overline{) 410} \\
 \underline{384} \\
 564 \overline{) 2600} \\
 \underline{2256} \\
 5686 \overline{) 34400} \\
 \underline{34116} \\
 569204 \overline{) 2840000} \\
 \underline{2276816}
 \end{array}$$

iv. $\cdot 00 \overline{) 13 \overline{) 98 \overline{) 76}}$ (-0374

$$\begin{array}{r}
 9 \\
 67 \overline{) 498} \\
 \underline{469} \\
 744 \overline{) 2976} \\
 \underline{2976} \\
 \dots
 \end{array}$$

v. $\sqrt{1\frac{88}{169}} = \sqrt{\frac{188}{169}} = \frac{13}{13} = 1\frac{2}{13}$.

$$\begin{array}{r}
 2 \overline{) 25} \text{ (15} \\
 \underline{1} \\
 25 \overline{) 125} \\
 \underline{125} \\
 \dots
 \end{array}
 \qquad
 \begin{array}{r}
 1 \overline{) 69} \text{ (13} \\
 \underline{1} \\
 23 \overline{) 69} \\
 \underline{69} \\
 \dots
 \end{array}$$

vi. $\cdot 00 \overline{) 01 \overline{) 56 \overline{) 25}}$ (-0125

$$\begin{array}{r}
 1 \\
 22 \overline{) 56} \\
 \underline{44} \\
 245 \overline{) 1225} \\
 \underline{1225} \\
 \dots
 \end{array}$$

vii. $4 \overline{) 20 \overline{) 29 \overline{) 10 \overline{) 01}}$ (2·0501

$$\begin{array}{r}
 4 \\
 405 \overline{) 2029} \\
 \underline{2025} \\
 41001 \overline{) 41001} \\
 \underline{41001} \\
 \dots
 \end{array}$$

viii. $35 \overline{) 88 \overline{) 12 \overline{) 98 \overline{) 01}}$ (59·901

$$\begin{array}{r}
 25 \\
 109 \overline{) 1088} \\
 \underline{981} \\
 1189 \overline{) 10712} \\
 \underline{10701} \\
 119801 \overline{) 119801} \\
 \underline{119801} \\
 \dots
 \end{array}$$

ix. $33 \overline{) 19 \overline{) 48 \overline{) 82 \overline{) 50}}$ (57·615 &c.

$$\begin{array}{r}
 25 \\
 107 \overline{) 819} \\
 \underline{749} \\
 1146 \overline{) 7048} \\
 \underline{6876} \\
 11521 \overline{) 17282} \\
 \underline{11521} \\
 115225 \overline{) 576150} \\
 \underline{576125} \\
 \dots 25
 \end{array}$$

x. $39|15|38|03|29$ (62573

36

122) 315

244

1245) 7138

6225

12507) 91303

87549

125143) 375429

375429

.....

xi. $\sqrt{41\frac{184}{225}} = \sqrt{\frac{9409}{225}} = \frac{97}{15} = 6\frac{7}{15}$.

94|09 (97

81

187) 1309

1309

....

2|25 (15

1

25) 125

125

...

2) $(\frac{17}{20} + \frac{11}{15} + \frac{7}{10} + \frac{4}{5}) + (\frac{17}{20} - \frac{11}{15} + \frac{7}{10} - \frac{4}{5}) = \frac{185}{60} + \frac{1}{60} = \frac{185}{60} \times \frac{60}{1} = 185$.

0)

i. $12) 1\cdot50$

20) 1\cdot25000

·05625.

ii. $(1\cdot3625 \times £1) + (\cdot75 \times 13s. 4d.) + (\frac{2}{3} \times £20) = £1 7s. 3d. + 10s. + £13 6s. 8d. = £15 3s. 11d.$

1) i. $16\cdot02$

·0007

·011214

ii. $\cdot0021) \cdot0006594$ (·314

63

29

21

84

84

..

$$(22) \text{ i. } \frac{1\frac{1}{2} + 2\frac{5}{8}}{5\frac{1}{2} + 4\frac{1}{2}} = \frac{\frac{55}{8}}{\frac{97}{10}} = \frac{55}{12} \times \frac{10}{97} = \frac{375}{562}.$$

$$\text{ii. } \frac{5}{8} \text{ of } \frac{3}{4} \text{ of } \frac{3}{8} \text{ of } \frac{16}{21} = \frac{5}{14}.$$

$$(23) \text{ i. } .046875 \text{ tons.}$$

$$\begin{array}{r} 20 \\ \hline .937500 \text{ cwt.} \\ \hline 4 \\ \hline 3.7500 \text{ qrs.} \\ \hline 28 \\ \hline 600 \\ \hline 150 \\ \hline 21.00 \text{ lbs.} \\ 3 \text{ qrs. } 21 \text{ lbs.} \end{array}$$

$$\text{ii. } 12) 3.75$$

$$21 \left\{ \begin{array}{r} 3) 1.3125 \\ \hline 7) .4375 \\ \hline .0625 \end{array} \right.$$

$$\text{iii. } 10\frac{1}{2} \text{ s.} + 52\frac{1}{2} \text{ s.} = \frac{21}{2} = \frac{21}{105} = \frac{1}{5} = .2.$$

$$(24) \text{ i. } 12) 6.75$$

$$\begin{array}{r} 20) 12.5625 \\ \hline .628125 \end{array}$$

$$\text{ii. } 12) 6.75$$

$$\begin{array}{r} 20) 12.5625 \\ \hline 4.628125 \end{array}$$

$$(25) \frac{(\frac{2}{3} + \frac{5}{8} + \frac{1}{3}) \text{ of } (2\frac{1}{3} \text{ of } \frac{7}{12})}{\frac{2}{3} - \frac{5}{8} + \frac{7}{9} - (\frac{1}{4} \times \frac{7}{8})} = \frac{\frac{11}{8} \text{ of } \frac{7}{3} \text{ of } \frac{7}{12}}{\frac{1}{36}} = \frac{11}{8} \times \frac{7}{3} \times \frac{7}{12} \times \frac{36}{1} = \frac{539}{2} = 269\frac{1}{2}$$

$$(26) (\frac{2}{18} \text{ of } \frac{375}{1000} \text{ of } \frac{10}{1} = \frac{45}{84} \text{ s.}) + (\frac{4}{5} \text{ of } \frac{5}{2} = 2 \text{ s.}) - \frac{3}{4} \text{ s.} = \frac{45}{84} + 2 - \frac{3}{4} = 1\frac{61}{84} \text{ s.}$$

$$\therefore 1.953125 + 20 = 21.953125.$$

27) i. .00125) .0078125 (6.25 ii. .0032) .000123123 (.0384759375

750
312
250
725
725
...

96
271
256
152
128
243
224
190
160
300
288
120
96
240
224
160
160
...

iii. 21.5) 76.11 (3.54

645
1161
1075
860
860
...

iv. .0374) 27.5264 (736

2618
1346
1122
2244
2244
....

v. 2.831) 1350.04728 (476.88

11324
21764
19817
19477
16986
24912
22648
22648
22648
22648
.....

vi. .0024) .02016 (8.4

192
96
96
..

vii. .000235) .0088266 (37.56

$$\begin{array}{r}
 705 \\
 1776 \\
 1645 \\
 1316 \\
 1175 \\
 1410 \\
 1410 \\
 \dots
 \end{array}$$

$$(28) \left(\frac{2}{3} \times \frac{23}{10} = \frac{46}{30} \right) + \left(\frac{7}{4} \times \frac{8}{21} \times \frac{17}{1} = \frac{34}{3} \right) + \left(\frac{3}{2} \times \frac{23}{4} \times \frac{34}{51} = \frac{23}{10} \right) = \frac{46}{30} + \frac{34}{3} + \frac{23}{10} = \frac{95}{6} = 15\frac{5}{6}.$$

$$(29) P + \frac{P \times 7 \times 17}{100 \times 4 \times 2} = \frac{\pounds 259329}{460} \therefore P = \frac{259329}{460} \times \frac{800}{819} = \pounds \frac{1955}{3} = \pounds 651 \text{ } 13s. \text{ } 4d.$$

$$(30) \text{ i. } \frac{15}{17} \times \frac{24}{5} \times \frac{11}{30} \times \frac{25}{9} \times \frac{9}{35} = \frac{11}{7} = 1\frac{4}{7}.$$

$$\text{ii. } \left(\frac{1}{2} \text{ of } 13s. \text{ } 4d. \right) + \pounds 5 = \frac{1}{2} \times \frac{2}{3} \times \frac{1}{5} = \frac{2}{15}.$$

$$(31) \text{ As } \pounds 100 : \pounds 11187\frac{1}{2} :: \pounds 2\frac{1}{4} : \frac{22375 \times 9}{100 \times 2 \times 4} l. = \frac{\pounds 8055}{32} = \pounds 251 \text{ } 14s. \text{ } 4\frac{1}{2}d. \text{ income.}$$

$$(32) 7 + 10 + 13 = 30.$$

$$\text{Share of 1st} = \frac{7}{30} \text{ of } \frac{750}{1} = \pounds 175.$$

$$\text{,, 2nd} = \frac{10}{30} \text{ of } \frac{750}{1} = \pounds 250.$$

$$\text{,, 3rd} = \frac{13}{30} \text{ of } \frac{750}{1} = \pounds 325.$$

$$(33) \left. \begin{array}{l} \pounds 50 : \pounds 60\frac{1}{2} \\ \pounds 385 : \pounds 500 \end{array} \right\} :: 7 \text{ months.}$$

$$\text{Then } \frac{121 \times 500 \times 7}{2 \times 50 \times 385} = 11 \text{ months.}$$

$$(34) \frac{7}{24} : 1 :: \pounds 714\frac{7}{10} : \frac{7147 \times 24}{7 \times 10} l. = \pounds \frac{14292}{5} = \pounds 2450 \text{ } 8s.$$

$$(35) 25 \text{ fr.} : 140 \text{ fr.} :: \pounds 1 : \frac{140 \times 1}{25} l. = \pounds \frac{28}{5} = \pounds 5 \text{ } 12s.$$

$$(36) 14 \text{ E. mls.} : 154 \text{ E. mls.} :: 11 \text{ I. mls.} : \frac{154 \times 11}{14} \text{ mls.} = 121 \text{ miles.}$$

$$(37) \left. \begin{array}{l} 1260 \text{ tons} : 7560 \text{ tons} \\ 12 \text{ hrs.} : 8 \text{ is} \\ 14 \text{ dys.} : 7 \text{ dys.} \end{array} \right\} :: 15 \text{ pumps.}$$

$$\therefore \frac{7560 \times 8 \times 7 \times 15}{1260 \times 12 \times 14} = 30 \text{ pumps.}$$

38) Solid content of wall = $(520\frac{1}{4} \times 3 \times 15 \times 1\frac{1}{2})$ ft.

„ „ one brick = $(\frac{1}{2} \times \frac{3}{8} \times \frac{1}{4})$ ft.

\therefore number of bricks = $(520\frac{1}{4} \times 3 \times 15 \times 1\frac{1}{2}) \div (\frac{1}{2} \times \frac{3}{8} \times \frac{1}{4})$
 $= \frac{2081}{4} \times \frac{3}{1} \times \frac{15}{1} \times \frac{3}{2} \times \frac{3}{8} \times \frac{4}{1} = 499440.$

39) Cost price = $4\frac{7}{8}$ cwt. \times $\pounds 2\frac{5}{8} = \frac{39}{8} \times \frac{17}{8} = \frac{663}{64} \text{ l.} = \pounds 13 \text{ 16s. 3d.}$

Selling price = $546 \text{ lbs.} \times 8\frac{1}{2} \text{d.} = \pounds 19 \text{ 6s. 9d.}$

\therefore gain = $\pounds 19 \text{ 6s. 9d.} - \pounds 13 \text{ 16s. 3d.} = \pounds 5 \text{ 10s. 6d.}$

40) $\begin{array}{l} 22\text{A.} : 360\text{A.} \\ 12 \text{ men} : 7 \text{ men} \\ 10 \text{ hrs.} : 11 \text{ hrs.} \end{array} \left. \vphantom{\begin{array}{l} 22\text{A.} : 360\text{A.} \\ 12 \text{ men} : 7 \text{ men} \\ 10 \text{ hrs.} : 11 \text{ hrs.} \end{array}} \right\} :: 8 \text{ days.}$

Then $\frac{360 \times 7 \times 11 \times 8}{22 \times 12 \times 10} = 84 \text{ days.}$

41) Area of one side = $(4\frac{1}{2} \text{ ft.})^2$.

Area of six sides = $\frac{9}{2} \times \frac{9}{2} \times \frac{6}{1}$.

\therefore expense = $(\frac{9}{2} \times \frac{9}{2} \times \frac{6}{1} \times \frac{1}{12} \text{ l.}) \div 9 = \frac{9}{2} \times \frac{9}{2} \times \frac{6}{1} \times \frac{1}{12} \times \frac{1}{9} = \frac{9}{8} \text{ l.} = \pounds 1 \text{ 2s. 6d.}$

2) $\begin{array}{r|l} 14 \text{ lbs.} & \frac{1}{8} \\ \hline & \begin{array}{r} \pounds \quad \text{s.} \quad \text{d.} \\ 0 \quad 12 \quad 2 \\ \hline 4 \quad 5 \quad 2 \\ \hline 17 \quad 0 \quad 8 \\ \hline 1 \quad 6\frac{1}{2} \end{array} \\ \hline & \pounds 17 \quad 2\text{s.} \quad 2\frac{1}{2}\text{d.} \end{array}$

3) Value of cargo = $\pounds 21456 \text{ 8s. 9d.} - \pounds 4978 = \pounds 16478 \text{ 8s. 9d.}$

4) $\begin{array}{l} 24000 \text{ yds.} : 36000 \text{ yds.} \\ 1\frac{1}{2} \text{ yds.} : 1\frac{1}{4} \text{ yds.} \\ 4\frac{1}{2} \text{d.} : 9\text{d.} \end{array} \left. \vphantom{\begin{array}{l} 24000 \text{ yds.} : 36000 \text{ yds.} \\ 1\frac{1}{2} \text{ yds.} : 1\frac{1}{4} \text{ yds.} \\ 4\frac{1}{2} \text{d.} : 9\text{d.} \end{array}} \right\} :: \pounds 400.$

$\therefore \frac{66000 \times 5 \times 9 \times 400 \times 4 \times 2}{24000 \times 7 \times 9} \text{ l.} = \pounds \frac{66000}{7} = \pounds 857 \text{ 2s. } 10\frac{2}{7}\text{d.}$

5) Weight of alloy = $\frac{1}{12}$ of 3 oz. 5 dwts. = 5 dwts. 10 gra.

16) $\begin{array}{l} 17\frac{1}{3} \text{ l.} : 10\frac{2}{3} \text{ l.} \\ 63 \text{ dys.} : 56 \text{ dys.} \\ 4\text{s.} : 4\frac{1}{2}\text{s.} \end{array} \left. \vphantom{\begin{array}{l} 17\frac{1}{3} \text{ l.} : 10\frac{2}{3} \text{ l.} \\ 63 \text{ dys.} : 56 \text{ dys.} \\ 4\text{s.} : 4\frac{1}{2}\text{s.} \end{array}} \right\} :: 13 \text{ horses.}$

Then $\frac{32 \times 56 \times 9 \times 3 \times 13}{52 \times 63 \times 4 \times 3 \times 2} = 8 \text{ horses.}$

7) Area of sides = $2(24\frac{1}{2} + 11\frac{3}{4}) \times 11\frac{1}{2}$.

\therefore cost = $2(24\frac{1}{2} + 11\frac{3}{4}) \times 11\frac{1}{2} \times 1\frac{1}{2}\text{s.} = \frac{73}{1} \times \frac{23}{2} \times \frac{3}{2} = 1242\text{s.} = \pounds 62 \text{ 2s.}$

$$(48) \frac{4\frac{1}{2} - 2\frac{1}{4}}{6\frac{1}{2} - 2\frac{1}{4}} = \frac{\frac{5}{2}}{\frac{61}{14}} = \frac{5}{2} \times \frac{14}{61} = \frac{5}{22}.$$

$$(49) \text{Interest} = \frac{8383\frac{3}{4} \times 5 \times 3\frac{1}{4}}{100} = \frac{25000 \times 5 \times 13}{100 \times 4 \times 3} = \frac{2^5 \times 5^{125}}{6} = £1354 \text{ 3s. 4d.}$$

$$(50) \text{Number of c. ft. of water} = 24\frac{2}{3} \times 12\frac{1}{2} \times 1 = 7\frac{4}{3} \times \frac{51}{2} = \frac{229}{2} = 314\frac{1}{2}.$$

$$(51) \frac{4600 \times \frac{3}{480} \times T}{100} = 18\frac{2}{5}, \text{ or } \frac{4600 \times 3 \times T}{100 \times 480} = \frac{92}{5}.$$

$$\therefore T = \frac{92}{5} \times \frac{80}{23} = 64 \text{ days.}$$

$$(52) \frac{\frac{2}{3} + \frac{5}{8} + \frac{1}{18} - \frac{7}{9}}{48} = \frac{32 + 30 + 3 - 56}{48} = \frac{9}{48} = \frac{3}{16} = .1875.$$

$$(53) \text{Width of matting} = (37\frac{3}{4} \text{ ft.} \times 7\frac{1}{2} \text{ ft.}) + 75\frac{1}{2} \text{ ft.} = \frac{151}{4} \times \frac{15}{2} \times \frac{2}{151} = \frac{15}{2} \text{ ft.} \\ = 3 \text{ ft. 9 in.}$$

$$(54) \sqrt{7} = 2.6457 \text{ \&c.} \quad \sqrt{\frac{2}{7}} = \frac{2}{2.6457} = .7559.$$

$$\frac{4}{3 - \sqrt{7}} = \frac{4}{3 - 2.6457} = \frac{4}{.3543} = 11.2898 \text{ \&c.}$$

$$(55) M = £193 \text{ 2s. 6d.} = £193\frac{1}{2} = \frac{1545}{8}.$$

$$P + \frac{P \times 3 \times \frac{1}{4}}{\frac{1}{4} \times 100} = \frac{1545}{8} \therefore P = \frac{1545}{8} \times \frac{100}{3} = \frac{375}{2} = £187 \text{ 10s.}$$

EXERCISE LXVIII., p. 136.

$$(1) 1\frac{7}{10} + 3\frac{9}{18} + 2\frac{1}{20} + \frac{5}{24} = 6 \frac{168 + 135 + 12 + 50}{240} = 6\frac{365}{240} = 7\frac{25}{48}.$$

$$\text{Then } 10 - 7\frac{25}{48} = 2\frac{23}{48}.$$

$$(2) 1\frac{3}{50} \text{ d.} : £1 \text{ 6s. 6d.} :: \frac{1}{152} \text{ of } \frac{2}{3} \text{ of } 2\frac{1}{2} \text{ of } 40 \text{ lbs.}$$

$$: \frac{318 \text{ d.} \times 1 \times 2 \times 5 \times 40 \times 50}{53 \times 192 \times 3 \times 2} \text{ lbs.} = \frac{925}{6} \text{ lbs.} = 104\frac{1}{6} \text{ lbs.}$$

$$(3) \left. \begin{array}{l} 5 \text{ men} : 3 \text{ men} \\ 7 \text{ acres} : 35 \text{ acres} \\ 8 \text{ hours} : 9 \text{ hours} \end{array} \right\} :: 5 \text{ days.}$$

$$\text{Then } \frac{3 \times 35 \times 9 \times 5}{5 \times 7 \times 8} \text{ days} = \frac{135}{8} \text{ days} = 16\frac{7}{8} \text{ days.}$$

$$(4) 2\frac{3}{4} \text{ lbs.} : \frac{3}{16} \text{ lbs.} :: 12 \text{ s. 9d.} : \frac{3 \times 153 \times 4}{11 \times 16} \text{ d.} = \frac{459}{44} \text{ d.} = 10\frac{19}{44} \text{ d.} = 10.4318 \text{ d.}$$

$$(5) \text{Number of yards} = \{ (27.3 \times 20.16) + 4.81\frac{1}{3} \} = (27\frac{1}{3} \times 20\frac{1}{8} + 4\frac{5}{6}) \times \frac{1}{3} \\ = \frac{92}{3} \times \frac{121}{8} \times \frac{9}{44} \times \frac{1}{3} = \frac{451}{12} \text{ yards} = 37\frac{7}{12} \text{ yards.}$$

6) $\sqrt{5\frac{31}{225}} = \sqrt{\frac{1156}{225}} = \frac{34}{15} = 2\frac{4}{15}$.

7)
$$\begin{array}{r} 134 \overline{) 217728} \quad (512 \\ 125 \end{array}$$

$5^2 \times 300 =$	7500	9217
$5 \times 30 \times 1 =$	150	
$1^2 =$	1	
	7651	7651
$51^2 \times 300 =$	780300	1566728
$51 \times 2 \times 30 =$	3060	
$2^2 =$	4	
	783364	1566728

8) Interest = £1884 18s. 11d. - £1303 6s. 8d. = £581 12s. 3d. = $\frac{46529}{80}\%$.

$\frac{3910 \times 7 \times R}{3 \times 100} = \frac{46529}{80} \therefore R = \frac{46529}{80} \times \frac{30}{391 \times 7} = \frac{51}{8} = 6\frac{3}{8}$ per cent.

9) £100 stk. : £1475 stk. :: £3 : $\frac{1475 \times 3}{100} \text{ l.} = £\frac{177}{4} = £44 \text{ 5s. 1st income.}$

£100 stk. : £1475 stk. :: £75 $\frac{1}{4}$: $\frac{1475 \times 301}{100 \times 4} \text{ l. sterling.}$

£110 $\frac{5}{8}$: $\frac{1475 \times 301}{100 \times 4} \text{ l.} :: £5 : \frac{1475 \times 301 \times 5 \times 8}{885 \times 100 \times 4} \text{ l.} = \frac{301}{9} \text{ l.}$

= £50 3s. 4d. 2nd income.

\therefore difference = £50 3s. 4d. - £44 5s. = £5 18s. 4d.

0) *P + $\frac{P \times 43 \times \frac{1}{2}}{100 \times \frac{8}{2}} = \frac{1215}{1} \therefore P = \frac{1215}{1} \times \frac{200}{243} = £1000$.

1) $1 - \frac{1}{20}$ or $\frac{19}{20} : 1 :: £9\frac{1}{2} : \frac{20 \times 19}{19 \times 2} \text{ l.} = £10$ cost price.

Gain = £11 17s. 6d. - £10 = £1 17s. 6d.

Gain per cent. = $\frac{100 \times 1\frac{7}{6}}{10} = \frac{100 \times 15}{10 \times 6} = \frac{75}{4} = 18\frac{3}{4}\%$.

2) Gain = $\frac{1}{25}$ of £157 5s. 10d. = £6 5s. 10d.

\therefore selling price = £157 5s. 10d. + £6 5s. 10d. = £163 11s. 8d.

As six were sold for £7 4s. $\times 6 = £43 \text{ 4s.}$

\therefore value of remaining 8 = £163 11s. 8d. - £43 4s. = £120 7s. 8d.

\therefore value of each remaining = £120 7s. 8d. $\div 8 = £15 \text{ 0s. } 11\frac{1}{2} \text{ d.}$

* See pp. 92 and 101 in the Arithmetic.

$$(13) 1\frac{7}{11} + 2\frac{7}{18} + 3\frac{5}{22} + \frac{9}{24} = 6 + \frac{336 + 231 + 120 + 198}{528} = 6\frac{885}{528} = 7\frac{113}{176}.$$

$$\text{Then } 10 - 7\frac{113}{176} = 2\frac{57}{176}.$$

$$(14) 1\frac{3}{7} \text{ of } \frac{3}{10} \text{ of } 1\frac{3}{4} \text{ tons} : \frac{3}{2} \text{ tons} :: £4\frac{1}{2} : \frac{3 \times 9 \times 7 \times 40 \times 4}{10 \times 3 \times 7 \times 5 \times 2} = \frac{72}{5}.$$

$$= £14 \text{ 8s.}$$

$$(15) \begin{array}{l} 5 \text{ men} : 3 \text{ men} \\ 14 \text{ acres} : 35 \text{ acres} \\ 10 \text{ hours} : 9 \text{ hours} \end{array} \left. \vphantom{\begin{array}{l} 5 \text{ men} \\ 14 \text{ acres} \\ 10 \text{ hours} \end{array}} \right\} :: 5 \text{ days.}$$

$$\text{Then } \frac{3 \times 35 \times 9 \times 5}{5 \times 14 \times 10} \text{ days} = \frac{27}{4} \text{ days} = 6\frac{3}{4} \text{ days.}$$

$$(16) 2\frac{3}{8} \text{ lbs.} : \frac{5}{12} \text{ lbs.} :: 9\frac{1}{2} \text{ s.} : \frac{5 \times 19 \times 8}{19 \times 12 \times 2} \text{ s.} = \frac{5}{3} \text{ s.} = 1 \text{ s. 8d.}$$

$$(17) \text{ Number of yards} = \{(27 \cdot 3 \times 10 \cdot 083) + 7 \cdot 3\} \frac{1}{3} = (27\frac{1}{3} \times 10\frac{1}{13} \div 7\frac{1}{3})$$

$$= \frac{82}{3} \times \frac{121}{13} \times \frac{3}{22} \times \frac{1}{3} = \frac{451}{36} \text{ yds.} = 12\frac{19}{36} \text{ yards.}$$

$$(18) \sqrt{\frac{4213}{2889}} = \sqrt{\frac{1369}{2889}} = \frac{37}{17} = 2\frac{3}{17}.$$

$$\begin{array}{r} 13 \overline{)69 \text{ (37)}} \\ \underline{9} \\ 67 \overline{)469} \\ \underline{469} \\ \dots \end{array} \qquad \begin{array}{r} 2 \overline{)89 \text{ (17)}} \\ \underline{1} \\ 27 \overline{)189} \\ \underline{189} \\ \dots \end{array}$$

$$(19) \begin{array}{r} \cdot 514 \overline{)788 \overline{)480 \text{ (} \cdot 801 \text{ \&c.)}}} \\ \underline{512} \end{array}$$

$$\begin{array}{r} 80^2 \times 300 = 1920000 \\ 80 \times 1 \times 30 = 2400 \\ 1^2 = 1 \\ \hline 1922401 \end{array} \quad \begin{array}{r} 2788480 \\ \\ \\ 1922401 \\ \hline 866079 \end{array}$$

$$(20) \text{ Interest} = £1687 \text{ 14s. 10d.} - £1303 \text{ 6s. 8d.} = £384 \text{ 8s. 2d.} = \frac{46128}{120}.$$

$$P = £1303\frac{1}{3} \text{ or } £\frac{3909}{3}.$$

$$\frac{3910 \times 10 \times R}{100 \times 3} = \frac{46128}{120} \therefore R = \frac{46128}{120} \times \frac{3}{391} = £\frac{46128}{1303} = £2 \text{ 18s. } 11\frac{337}{391} \text{d.}$$

$$21) £90\frac{3}{4} : £9075 :: £3 : \frac{9075 \times 3 \times 4}{363}l. = £300 \text{ 1st income.}$$

$$£90\frac{3}{4} : £9075 :: £\frac{1}{4} : \frac{9075 \times 1 \times 4}{363 \times 4}l. = £25 \text{ gain.}$$

$$£93\frac{1}{2} : £9075 + £25 :: £3\frac{1}{4} : \frac{9100 \times 15 \times 2}{187 \times 4}l. = £\frac{22250}{187}$$

$$= £364 \text{ 9s. } 5\frac{100}{187}d. \text{ 2nd income.}$$

$$\therefore \text{ difference} = £364 \text{ 19s. } 5\frac{100}{187}d. - £300 = £64 \text{ 19s. } 5\frac{100}{187}d.$$

$$22) \text{ To gain 40 per cent., or } \frac{2}{5}, 20 \text{ must be sold for } 1\frac{1}{2} \text{ shilling.}$$

$$\therefore 1\frac{1}{2}s. : 48s. :: 20 : \frac{48 \times 20 \times 5}{7} = \frac{4800}{7} = 685\frac{5}{7} \text{ oranges.}$$

$$23) *P + \frac{P \times 2 \times 5\frac{3}{8}}{100} = £553\frac{3}{4}; \text{ or } P + \frac{P \times 2 \times 43}{100 \times \frac{8}{4}} = \frac{2215}{4}.$$

$$\therefore P = \frac{2215}{4} \times \frac{400}{43} = £500.$$

$$24) 98 : 100 :: 3 : \frac{100 \times 3}{98} = \frac{150}{49} = 3\frac{3}{49} \text{ income by investing } £100 \text{ in}$$

the 3 per Cents.

$$\therefore \text{ increase} = 5 - 3\frac{3}{49} = 1\frac{46}{49}.$$

$$3\frac{3}{49} : 100 :: 1\frac{46}{49} : \frac{100 \times 95 \times 49}{150 \times 49} = \frac{190}{3} = 63\frac{1}{3} \text{ increase per cent.}$$

$$5) 3\frac{2}{3} + 1\frac{2}{20} + 2\frac{7}{12} + 1\frac{8}{15} = 7\frac{40 + 27 + 35 + 32}{60} = 7\frac{134}{60} = 9\frac{7}{30}.$$

$$\text{Then } 12 - 9\frac{7}{30} = 2\frac{23}{30}.$$

$$6) \frac{1}{1\frac{1}{3}} \text{ of } 3\frac{2}{3} \text{ of } \frac{7}{8} \text{ of } 5\frac{1}{2} \text{ of } 22 \text{ lbs. : 1 ton 11 cwt. 3 qrs. :: } 8\frac{1}{4}d.$$

$$: \frac{127 \times 28 \times 143 \times 3 \times 9 \times 5 \times 33}{11 \times 7 \times 26 \times 22 \times 4}d. = \frac{51435}{4}d. = £53 \text{ 11s. } 6\frac{3}{4}d.$$

$$7) \left. \begin{array}{l} 14 \text{ lbs. : } 31\frac{1}{2} \text{ lbs.} \\ 6s. : 4s. \end{array} \right\} :: 2s. \text{ Then } \frac{63 \times 4 \times 2}{14 \times 6 \times 2}s. = 3s.$$

$$8) 15s. 3d. : £4 \text{ 3s. } 10\frac{1}{2}d. :: 3\frac{1}{2} \text{ lbs. : } \frac{2013 \times 17}{183 \times 2 \times 5} \text{ lbs.} = \frac{187}{10} \text{ lbs.}$$

$$= 18\frac{7}{10} \text{ lbs.}$$

$$9) \text{ Area of walls} = 2(42 + 28) \text{ sq. ft.} \times 12 \text{ ft.}$$

$$\text{Cost} = \{2(42 + 28) \text{ sq. ft.} \times 12 \text{ ft.}\} \times \frac{3}{80}d. + 2\frac{1}{4} \text{ ft.} = \frac{70}{1} \times \frac{2}{1} \times \frac{12}{1} \times \frac{3}{80} \times \frac{4}{5}$$

$$= £\frac{28}{3} = £9 \text{ 6s. } 8d.$$

* See pp. 92 and 101 in the Arithmetic.

$$(30) \sqrt{33\frac{14}{25}} = \sqrt{\frac{7349}{25}} = \frac{85}{5} = 17.$$

$$\begin{array}{r} 75 \ 69 \ (87 \\ 64 \\ \hline 167) 1169 \\ 1169 \\ \hline \dots \end{array}$$

$$\begin{array}{r} 2 \overline{) 25} \ (15 \\ 1 \\ \hline 25) 125 \\ 125 \\ \hline \dots \end{array}$$

$$(31) \begin{array}{r} 12 \overline{) 167} \ (23 \\ 8 \\ \hline 2^2 \times 300 = 1200 \\ 2 \times 3 \times 30 = 180 \\ 3^2 = 9 \\ \hline 1389 \end{array} \quad \begin{array}{r} 4167 \\ 4167 \end{array}$$

$$(32) \text{Interest} = £602 \ 13s. \ 4\frac{1}{2}d. - £527 \ 10s. = £75 \ 3s. \ 4\frac{1}{2}d. \text{ or } £\frac{26061}{480};$$

$$P = £527\frac{1}{2} \text{ or } £\frac{1055}{2}.$$

$$\frac{1055 \times 19 \times N}{100 \times 2 \times 4} = \frac{26061}{480} \therefore N = \frac{26061}{480} \times \frac{800}{1055 \times 19} = 3 \text{ years.}$$

$$(33) 1 - \frac{7}{240} \text{ or } \frac{233}{240} \text{ of your income represents } £932.$$

$$\therefore \frac{233}{240} : 1 :: £932 : \frac{240 \times 932}{233} l. = £960 \text{ gross income.}$$

$$£3\frac{1}{2} : £960 :: £91 : \frac{960 \times 91 \times 2}{7} l. = £24960 \text{ sum invested.}$$

$$(34)^* P + \frac{P \times 3 \times 23}{100 \times 5} = \frac{26743}{10} \therefore P = \frac{26743}{10} \times \frac{500}{569} = £2350.$$

$$(35) \text{Cost price} = (3 \times 112 \times 5d.) + (7 \times 112 \times 6\frac{1}{2}d.) = 1680d. + 5096d. = 6776d.$$

$$\text{Gain} = \frac{1}{2} \text{ of } 6776 \text{ or } 3388d.$$

$$\therefore \text{selling price of whole} = 6776d. + 3388d. = 10164d.$$

$$\text{Selling price of } 5\frac{1}{2} \text{ cwt.} = 5\frac{1}{2} \times 112 \times 5\frac{1}{2}d. = 3388d.$$

$$\therefore \text{remaining } 4\frac{1}{2} \text{ cwt. or } 504 \text{ lbs. are sold for } 10164d. - 3388d. = 6776d.$$

$$\therefore \text{selling price per pound of remainder} = 6776 \div 504 = 13\frac{4}{3}d. \text{ or } 1s. \ 1\frac{2}{3}d.$$

* See pp. 92 and 101 in the Arithmetic.

		£	s.	d.
(36)	80 lbs. @ 14d. per lb.	=	4	13 4
	100 lbs. @ 20d. per lb.	=	8	6 8
	60 lbs. @ 4s. 10d. per lb.	=	14	10 0
	20 lbs. @ 2s. 10d. per lb.	=	2	16 8
	∴ 260 lbs. cost		£30	6 8

$$260 \text{ lbs.} : 3 \text{ oz.} :: £30 \text{ 6s. 8d.} : \frac{7280 \times 3}{260 \times 16} d. = 3\frac{1}{4} d. = 5\frac{1}{4} d.$$

$$(37) \left(\frac{5}{13} \text{ of } 240d. \right) + \left(\frac{3}{13} \text{ of } 80d. \right) + \left(\frac{1}{40} \text{ of } 60d. \right) + \left(\frac{9}{13} \text{ of } 1d. \right) = 92\frac{4}{13} + 15 + 1\frac{1}{2} + \frac{9}{13} = 109\frac{1}{2}d. = 9s. 1\frac{1}{2}d.$$

$$(38) \frac{2}{57} \times \frac{7}{2} \times \frac{38}{5} \times \frac{4}{7} \times 36 \text{ lbs.} : 17 \text{ tons } 17 \text{ cwt.} :: 12s. 6\frac{1}{2}d. : \frac{357 \times 112}{1} \\ \times \frac{301}{2} \times \frac{57}{2} \times \frac{2}{7} \times \frac{5}{38} \times \frac{7}{4} \times \frac{1}{36} d. = \frac{1252865}{4} d. = £1305 \text{ 18s. } 0\frac{1}{4}d.$$

$$(39) \left. \begin{array}{l} 8 \text{ men} : 12 \text{ men} \\ 15 \text{ yds.} : 20 \text{ yds.} \\ 4 \text{ " } : 8 \text{ " } \\ 9 \text{ hrs.} : 12 \text{ hrs.} \end{array} \right\} :: 3 \text{ dys.} \text{ Then } \frac{12 \times 20 \times 8 \times 12 \times 3}{8 \times 15 \times 4 \times 9} \text{ dys.} \\ = 16 \text{ days.}$$

$$(40) \text{ Area of walls} = 2(19 \text{ ft. } 10\frac{1}{4} \text{ in.} + 16 \text{ ft. } 1\frac{1}{2} \text{ in.}) \times 10\frac{1}{4} \text{ ft.} \\ \therefore \text{ cost} = (36 \times 2 \times 10\frac{1}{4} \times 19d.) + 9 = 3\frac{9}{1} \times \frac{2}{1} \times \frac{4}{4} \times \frac{1}{1} \times \frac{1}{9}d. = 1558d. \\ = £6 \text{ 9s. } 10d.$$

$$(41) \text{ In 1 minute } A \text{ and } B \text{ fill } \frac{1}{20}, \frac{1}{25} \text{ respectively, and } C \text{ empties } \frac{1}{18}. \\ \therefore \frac{1}{20} + \frac{1}{25} - \frac{1}{18} = \frac{31}{900} \text{ of the cistern is filled in 1 minute.} \\ \therefore \text{ the cistern is filled in } \frac{900}{31} \text{ or } 29\frac{1}{31} \text{ min.}$$

$$(42) \sqrt{514\frac{185}{256}} = \sqrt{\frac{131765}{256}} = \frac{363}{16} = 22\frac{11}{16}.$$

13|17|69 (363	2|56 (16
9	1
66) 417	26) 156
396	156
723) 2169	...
2169	
....	

(43)		228|099|131 (611 216
	$6^2 \times 300 = 10800$	12099
	$6 \times 1 \times 30 = 180$	
	$1^2 = 1$	
	10981	10981
	$61^2 \times 300 = 1116300$	1118131
	$61 \times 1 \times 30 = 1830$	
	$1^2 = 1$	
	1118131	1118131

(44) Interest = £2249 9s. 9d. - £2063 15s. = £185 14s. 9d. = $\frac{£44577}{240}$.

$$\frac{2063\frac{3}{4} \times 2\frac{1}{2} \times R}{100} = \frac{44577}{240} \therefore R = \frac{44577}{240} \times \frac{100 \times 4 \times 2}{8255 \times 5} = \frac{36}{10} = 3\frac{3}{5} \text{ per cent.}$$

(45) £90 $\frac{3}{4}$: £9075 :: £3 : $\frac{9075 \times 3 \times 4}{363} \text{ l.} = \text{£300 1st income.}$

$$\text{£90}\frac{3}{4} : \text{£9075} :: \text{£}\frac{1}{4} : \frac{9075 \times \frac{1}{4}}{90\frac{3}{4}} \text{ l.} = \frac{9075 \times 4}{363 \times 4} \text{ l.} = \text{£25 gain.}$$

$$97\frac{1}{2} : \text{£9075} + \text{£25} :: \text{£}3\frac{1}{2} : \frac{9100 \times 3\frac{1}{2}}{97\frac{1}{2}} \text{ l.} = \frac{9100 \times 7 \times 2}{195 \times 2} \text{ l.} = \frac{£12740}{39}$$

= £326 13s. 4d. 2nd income.

\therefore difference = £326 13s. 4d. - £300 = £26 13s. 4d.

(46) (4 lbs. \times 3s.) + (7 lbs. \times 4s.) = 40s. cost of 11 lbs.

\therefore cost price per lb. = $\frac{40}{11}$ s. or 3s. 7 $\frac{7}{11}$ d.

Gain = 4s. 2d. - 3s. 7 $\frac{7}{11}$ d. = 6 $\frac{4}{11}$ d.

$$3\text{s. } 7\frac{7}{11}\text{d.} : 100 :: 6\frac{4}{11}\text{d.} : \frac{100 \times 6\frac{4}{11}}{43\frac{7}{11}} = \frac{175}{12} = 14\frac{7}{12} \text{ gain per cent.}$$

(47) The population of six parishes = 1256 \cdot 5 \times 6 = 7539.

Population of five parishes = 1236 + 452 + 364 + 516 + 3430 = 5998.

\therefore population of sixth parish = 7539 - 5998 or 1541.

(48) Loss on every £100 = £100 - £91 $\frac{2}{3}$ or £8 $\frac{1}{3}$.

$$\text{£100} : \text{£3484} :: \text{£}8\frac{1}{3} : \frac{25 \times 3484}{100 \times 3} \text{ l.} = \frac{£871}{3} = \text{£290 6s. 8d. entire loss.}$$

9) Population of 1st town in 1851 = $\frac{21326 \times 112}{100} = 23885.12$.

Population of 2nd town in 1851 = $\frac{42324 \times 110}{100} = 46556.4$.

Population of 3rd town in 1851 = $\frac{6706 \times 82}{100} = 5498.92$.

\therefore average in 1851 = $(23885.12 + 46556.4 + 5498.92) \div 3 = 25313.48$.

0) He gains 14 articles on every 22 he sells; what does he gain per cent.?

As $22 : 100 :: 14 : \frac{100 \times 14}{22} = \frac{700}{11} = 63\frac{7}{11}$.

1) $1\frac{1}{8} : 1 :: 5\frac{1}{3}s. : \frac{16 \times 8}{9 \times 3}s. = \frac{128}{27}s. = 4s. 8\frac{8}{9}d.$ cost price.

\therefore gain = $6s. 2d. - 4s. 8\frac{8}{9}d. = 1s. 5\frac{1}{9}d.$

$4s. 8\frac{8}{9}d. : 100 :: 1s. 5\frac{1}{9}d. : \frac{100 \times 154 \times 9}{9 \times 514} = \frac{1325}{514} = 30\frac{5}{84}$ gain per cent.

2) $\begin{aligned} \text{£}96 : \text{£}100 &:: \text{£}3 : \frac{100 \times 3}{96} = \frac{25}{8} \\ \text{£}106\frac{2}{3} : \text{£}100 &:: \text{£}5 : \frac{100 \times 5 \times 3}{320} = \frac{75}{16} \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{£}96 : \text{£}100 &:: \text{£}3 : \frac{100 \times 3}{96} = \frac{25}{8} \\ \text{£}106\frac{2}{3} : \text{£}100 &:: \text{£}5 : \frac{100 \times 5 \times 3}{320} = \frac{75}{16} \end{aligned}} \right\} \begin{array}{l} \text{Income from investing} \\ \text{£}100. \end{array}$

\therefore increase in income = $\frac{75}{16} - \frac{25}{8} = \frac{25}{16}$.

$\frac{25}{8} : 100 :: \frac{25}{16} : \frac{100 \times 25 \times 8}{25 \times 16} = 50$ per cent. increase.

3) Average = $(13 + 27 + 0 + 46 + 72 + 86) \div 6 = 244 \div 6 = 40\frac{2}{3}$.

4) Population of 1st town in 1851 = $\frac{20325 \times 109}{100} = 22154.25$.

Population of 2nd town in 1851 = $\frac{41304 \times 110}{100} = 45434.4$.

Population of 3rd town in 1851 = $\frac{6117 \times 112}{100} = 6851.04$.

\therefore average = $(22154.25 + 45434.4 + 6851.04) \div 3 = 74439.69 \div 3 = 24813.23$.

5) Gain = $\text{£}2 \text{ 11s. 4d.} - \text{£}2 \text{ 5s. 10d.} = 5s. 6d.$

$\text{£}2 \text{ 5s. 10d.} : 100 :: 5s. 6d. : \frac{100 \times 66}{550} = 12$ gain p.c.

$$(56) \text{ £100 : £6417 14s. 2d. :: £2}\frac{3}{5} : \frac{1540250 \times 2\frac{3}{5}}{100} \text{ l.} = \frac{1540250 \times 13}{100 \times 240 \times 5} \text{ l.}$$

$$= \text{£}\frac{800925}{480} = \text{£166 17s. 2}\frac{1}{2}\text{d. premium.}$$

$$(57) 16 \text{ p.c.} = \frac{4}{25} \therefore 1\frac{4}{25} : 1 :: \text{£1 1s. 9d.} : \frac{25 \times 261}{29} \text{ d.} = 225 \text{ d.} = 18 \text{ s. 9d.}$$

prime cost.

$$(58) \text{ Cost price} = (5 \times 112 \times 3 \text{ d.}) + (9 \times 112 \times 4\frac{1}{2} \text{ d.}) = 1680 \text{ d.} + 4536 \text{ d.}$$

$$= 6216 \text{ d.}$$

$$\text{Gain} = \frac{1}{2} \text{ of } 6216 \text{ or } 3108.$$

$$\therefore \text{ selling price of whole} = 6216 \text{ d.} + 3108 \text{ d.} = 9324 \text{ d.}$$

$$\text{Selling price of } 6\frac{1}{2} \text{ cwt.} = (6\frac{1}{2} \times 112 \times 4 \text{ d.}) = 2912 \text{ d.}$$

$$\therefore \text{ selling price of each of the } 7\frac{1}{2} \text{ cwt. or 840 lbs. remaining}$$

$$= (9324 \text{ d.} - 2912 \text{ d.}) + 840 = 7\frac{13}{30} \text{ d.}$$

$$(59) \text{ £91}\frac{1}{4} + \text{£}\frac{1}{8} : \text{£540} :: \text{£100} : \frac{540 \times 100}{91\frac{1}{8}} \text{ l.} = \frac{\text{£}86400}{147} = \text{£}587\frac{37}{148}.$$

$$(60) \text{ Income from investment of £100 in the 3 per Cents} = \frac{100 \times 3}{96} = \frac{25}{8}.$$

$$\therefore \text{ gain} = 5 - \frac{25}{8} = \frac{15}{8}.$$

$$\frac{25}{8} : 100 :: \frac{15}{8} : \frac{100 \times 15}{25} = 60 \text{ gain per cent.}$$

$$(61) \text{ Average} = (13 + 27 + 0 + 32 + 106 + 86) \div 6 = 264 \div 6 = 44.$$

$$(62) \text{ Population of 1st town in 1851} = \frac{20325 \times 109}{100} = 22154 \cdot 25.$$

$$\text{Population of 2nd town in 1851} = \frac{42405 \times 110}{100} = 46645 \cdot 5.$$

$$\text{Population of 3rd town in 1851} = \frac{1423 \times 112}{100} = 1593 \cdot 76.$$

$$\therefore \text{ average population} = (22154 \cdot 25 + 46645 \cdot 5 + 1593 \cdot 76) \div 3$$

$$= 70393 \cdot 51 \div 3 = 23464\frac{151}{300}.$$

$$(63) \text{ Gain} = \text{£2 14s. 1d.} - \text{£2 5s. 10d.} = 8 \text{ s. 3d.}$$

$$\text{£2 5s. 10d.} : 100 :: 8 \text{ s. 3d.} : \frac{100 \times 99}{550} \text{ d.} = 18 \text{ gain per cent.}$$

$$(64) \text{ £100 : £9626 11s. 3d. :: £2}\frac{3}{5} : \frac{2310375 \times 13}{100 \times 240 \times 5} \text{ l.} = \frac{\text{£}800925}{320}$$

$$= \text{£}250 \text{ 5s. } 9\frac{3}{4} \text{ d. premium.}$$

(65) As 12 per cent. = $\frac{3}{25}$ $\therefore 1\frac{3}{25} : 1 :: 19s. 3d. : \frac{1 \times 231 \times 25}{28}d. = \frac{835}{4}d.$
 = 17s. 2 $\frac{1}{2}$ d. prime cost.

(66) Cost price = $(3 \times 112 \times 5d.) + (7 \times 112 \times 6\frac{1}{2}d.) = 1680d. + 5096d.$
 = 6776d.

Gain = $\frac{15}{100}$ of 6776 = 1016 $\frac{2}{5}$ d.

\therefore selling price of whole = 6776 + 1016 $\frac{2}{5}$ = 7792 $\frac{2}{5}$ d.

Selling price of 5 $\frac{1}{2}$ cwt. = $(5\frac{1}{2} \times 112 \times 5\frac{1}{2}d.) = 3388d.$

\therefore each of remaining 4 $\frac{1}{2}$ cwt. or 504 lbs. are sold for $(7792\frac{2}{5}d. - 3388d.) + 504 = 8\frac{254}{15}d.$

(67) £89 $\frac{1}{4}$ + £ $\frac{1}{8}$ or £89 $\frac{1}{8}$: £540 :: £100 : $\frac{100 \times 540 \times 8}{719}l. = \frac{£43200}{719}$
 = £600 $\frac{600}{719}$.

(68) Income from investment of £100 in the 3 $\frac{1}{2}$ per Cents = $\frac{100 \times 7}{98 \times 2} = 3\frac{1}{2}$.

Increase = 4 $\frac{1}{2}$ - 3 $\frac{1}{2}$ = $\frac{13}{14}$.

3 $\frac{1}{2}$: 100 :: $\frac{13}{14}$: $\frac{100 \times 13 \times 7}{25 \times 14} = 26$ increase per cent.

(69) $\cdot 601243 = \frac{601243 - 60}{999900} = \frac{601183}{999900} = \frac{54653}{90900}$.

(70) $\frac{4}{7} \times \frac{3}{2} \times \frac{77}{18} = \frac{11}{3} = 3\frac{2}{3}$ fur.; $\frac{5}{90} \times \frac{6}{90} \times \frac{8}{1} = \frac{8}{297}$ fur.

Then $3\frac{2}{3} + \frac{8}{297} = \frac{3208}{297} = 3$ fur. 27p. 4 yds. 0 ft. 3 $\frac{1}{3}$ in.

(71)

13|10|44|00 (3620
9
66) 410
396
722) 1444
1444
....

(72)

	586|376|253 (837
	512
8 ² × 300 = 19200	74376
8 × 3 × 30 = 720	
3 ² = 9	
19929	59787
83 ² × 300 = 2066700	14589253
83 × 7 × 30 = 17430	
7 ² = 49	
2084179	14589253

$$(73) \quad £90\frac{1}{2} : £12000 :: £3 : \frac{12000 \times 3}{90\frac{1}{2}} = £397 \text{ 4s. } 9\frac{27}{29}d \text{ 1st income.}$$

$$£103\frac{1}{2} : £12000 :: £5 : \frac{12000 \times 5}{103\frac{1}{2}} = £578 \text{ 6s. } 3\frac{15}{33}d \text{ 2nd income.}$$

$$\therefore \text{ difference} = £578 \text{ 6s. } 3\frac{15}{33}d - £397 \text{ 4s. } 9\frac{27}{29}d = £181 \text{ 1s. } 5\frac{601}{2407}d$$

$$(74) \quad \left. \begin{array}{l} 60s. : 40s. \\ 4 \text{ lbs.} : 25 \text{ lbs.} \end{array} \right\} :: 6d. \text{ Then } \frac{40 \times 25 \times 6}{60 \times 4}d = 25d, \text{ or } 2s. \text{ 1d.}$$

$$(75) \quad \text{Area of the walls} = 2(16 + 11) \text{ ft.} \times 10 \text{ ft.}$$

$$\therefore \text{ cost} = \frac{1}{3} \times 54 \times 10 \div \frac{29}{12} \times 7\frac{1}{2}d = \frac{54}{1} \times \frac{19}{1} \times \frac{15}{2} \times \frac{12}{36} \times \frac{1}{2} = 540d = £.$$

$$(76) \quad \begin{array}{r} \text{ft. in. pts.} \\ 7 \quad 5 \quad 8 \\ 9 \quad 4 \quad 11 \\ \hline 67 \quad 3 \quad 0 \\ 2 \quad 5 \quad 10 \quad 8 \\ 6 \quad 10 \quad 2 \quad 4 \\ \hline 70 \quad 3 \quad 8' \quad 10'' \quad 4''' = 70 \text{ ft. } 44\frac{31}{32} \text{ in.} \\ 12 \\ \hline 44\frac{31}{88} \text{ in. } \quad \frac{10}{12} + \frac{4}{144} = \frac{31}{36}. \end{array}$$

$$(77) \quad \begin{array}{r|l} 2s. & \frac{1}{10} \quad 3900 \\ 4d. & \frac{1}{8} \quad 390 \\ \frac{1}{2}d. & \frac{1}{8} \quad 65 \\ \hline & 8 \quad 2 \quad 6 \\ \hline \end{array} \quad £463 \quad 2s. \quad 6d. \text{ cost of printing.}$$

3900 copies are printed, but as 13 are sold to doz. only 3600 paid for.

Selling price per copy = 7s. 6d. - ($\frac{1}{4}$ of 7s. 6d.) = 5s. 7 $\frac{1}{2}$ d.

$$\begin{array}{r|l} 5s. & \frac{1}{4} \quad 3600 \\ 6d. & \frac{1}{10} \quad 900 \\ 1\frac{1}{2}d. & \frac{1}{4} \quad 90 \\ \hline & 22 \quad 10 \\ \hline \end{array} \quad £1012 \quad 10s. \text{ money received.}$$

\therefore profit = £1012 10s. - £463 2s. 6d. = £549 7s. 6d.; as the aut has half profits, he will receive £549 7s. 6d. $\div 2$ = £274 13s. 9d.

(78)

$7^2 \times 300 = 14700$	408|518|488 (742 343
$7 \times 4 \times 30 = 840$	65518
$4^2 = 16$	
<u>15556</u>	<u>62224</u>
$74^2 \times 300 = 1642800$	3294488
$74 \times 2 \times 30 = 4440$	
$2^2 = 4$	
<u>1647244</u>	<u>3294488</u>

(79) $\left. \begin{array}{l} 7 \text{ men} : 30 \text{ men} \\ 12 \text{ days} : 11 \text{ days} \\ 8\frac{1}{4} \text{ hrs.} : 7\frac{1}{2} \text{ hrs.} \end{array} \right\} :: 84\text{A.} \quad \text{Then } \frac{30 \times 11 \times 39 \times 8\frac{1}{4} \times 4}{7 \times 12 \times 33 \times 5} \text{A.}$
 = 312 acres.

(80) £100 stk. : £6000 stk. :: £3 : $\frac{6000 \times 3}{100} \text{l.} = \text{£180 1st income.}$

£100 stk. : £6000 stk. :: £92 $\frac{1}{4}$: $\frac{6000 \times 369}{100 \times 4} \text{l.} = \text{£5535 sterling.}$

£103 $\frac{1}{2}$: £5535 :: £5 $\frac{1}{2}$: $\frac{5535 \times 11 \times 8}{825 \times 2} \text{l.} = \text{£} \frac{1476}{5} = \text{£295 } 4\text{s. 2nd income.}$

∴ difference = £295 4s. - £180 = £115 4s.

(81)

ft.	in.	pts.	
2	7	11	
3	5	7	
7	11	9	
1	1	3	7
	1	6	7
		5	
9	2	7'	2" 5'''.

(82) $26153846 = \frac{26153846 - 26}{99999900} = \frac{26153820}{99999900} = \frac{17}{65}.$

$$(33) 15 \text{ per cent.} = \frac{3}{20} \therefore 1 - \frac{3}{20} \text{ or } \frac{17}{20} : 1 :: £272 : \frac{272 \times 20}{17} l.$$

= £320 cost price.

$$\therefore \text{gain} = 320 \text{ gs.} - £320 = £16.$$

$$320 : 100 :: 16 : \frac{100 \times 16}{320} = 5 \text{ gain per cent.}$$

$$(34) \text{Nitre} = (\frac{72}{100} \times \frac{20}{1}) + (\frac{17}{100} \times \frac{20}{1}) = 30\frac{3}{5} \text{ cwt.}$$

$$\text{Sulphur} = (\frac{10}{100} \times \frac{20}{1}) + (\frac{2}{100} \times \frac{20}{1}) = 3\frac{2}{5} \text{ cwt.}$$

$$\text{Charcoal} = (\frac{15}{100} \times \frac{20}{1}) + (\frac{14}{100} \times \frac{20}{1}) = 5\frac{4}{5} \text{ cwt.}$$

(35) There is a reduction of 1d. per cent. per day, or 365d., on every £100 per annum.

$$\therefore 365d. : £152 7s. 9d. :: £100 : \frac{36573d. \times 100}{365d.} l. = £10020.$$

$$(36) 17.5 + 25.25 + 96.375 + 42.75 + 56 + 10 = 247.875.$$

$$\therefore \text{average} = 247.875 \div 7 = 35.410714285.$$

$$(37) \text{Income of 21 persons} = £2000 + £2200 + £2400 + £2400 = £9000.$$

$$\therefore \text{average income of each person} = 9000 \div 21 = £428 \text{ 11s. } 5\frac{1}{2}d.$$

$$(38) £100 : £14500 :: £3\frac{1}{2} : \frac{14500 \times 7}{100 \times 2} l. = £191\frac{1}{2} = £507 \text{ 10s. insurance of ship.}$$

$$£100 : £32000 :: £5 : \frac{32000 \times 5}{100} l. = £1600 \text{ insurance of cargo.}$$

$$\therefore \text{whole cost of insurance} = £507 \text{ 10s.} + £1600 = £2107 \text{ 10s.}$$

$$(39) 86 : 84624 :: 100 : \frac{84624 \times 100}{86} = 98400 \text{ number of men before battle.}$$

$$82 : 98400 :: 100 : \frac{98400 \times 100}{82} = 120000 \text{ original army.}$$

$$(90) £100 \text{ stk.} : £5000 \text{ stk.} :: £94\frac{7}{8} : \frac{5000 \times 759}{100 \times 8} l. = £189\frac{75}{4} = £4743\frac{3}{4}.$$

$$£100 \text{ stk.} : £5000 \text{ stk.} :: £95\frac{5}{8} : \frac{5000 \times 765}{100 \times 8} l. = £191\frac{25}{4} = £4781\frac{1}{4}.$$

$$\therefore \text{he sells } £10000 \text{ stock for } £4743\frac{3}{4} + £4781\frac{1}{4} = £9525.$$

$$£100 \text{ stk.} : £10000 \text{ stk.} :: £96 : \frac{10000 \times 96}{100} l. = £9600 \text{ cost of } £10000 \text{ stock.}$$

$$\therefore \text{loss} = £9600 - £9525 = £75.$$

1) $\pounds 95\frac{3}{4} : \pounds 100 :: \pounds 3 : \frac{100 \times 3 \times 8}{763}l. = \pounds 24\frac{90}{103} = 3\frac{11}{16}\frac{1}{2}$ Consols.

$\pounds 108\frac{1}{2} : \pounds 100 :: \pounds 5\frac{1}{4} : \frac{100 \times 21 \times 2}{217 \times 4}l. = \pounds 105\frac{9}{117} = 4\frac{26}{31}$ Midl. Railway.

2) Population of England in 1851 = $\frac{21476000 \times 108.45}{100} = 23290722$.

Population of Ireland in 1851 = $\frac{7310000 \times 87.5}{100} = 6396250$.

Population of England and Ireland in 1841 = $21476000 + 7310000 = 28786000$.

Population of England and Ireland in 1851 = $23290722 + 6396250 = 29686972$.

Increase = $29686972 - 28786000 = 900972$.

\therefore increase per cent. = $\frac{900972 \times 100}{28786000} = 3.129 \text{ \&c.}, \text{ or } 3.13 \text{ nearly.}$

3) Cost of 5 cwt. of coffee = $\pounds 5 \text{ } 12s. \text{ } 6d. \times 5 = \pounds 28 \text{ } 2s. \text{ } 6d.$

„ 2 „ chicory = $\pounds 2 \text{ } 5s. \text{ } 5d. \times 2 = \pounds 4 \text{ } 10s. \text{ } 10d.$

\therefore cost price of whole = $\pounds 28 \text{ } 2s. \text{ } 6d. + \pounds 4 \text{ } 10s. \text{ } 10d. = \pounds 32 \text{ } 13s. \text{ } 4d.$

\therefore value of 1 lb. = $\pounds 32 \text{ } 13s. \text{ } 4d. \div 784 \text{ lbs.} = 10d.$

Gain = $1s. \text{ } 3d. - 10d. = 5d.$

$10 : 100 :: 5 : \frac{100 \times 5}{10} = 50$ gain per cent.

94) 10 per cent. = $\frac{1}{10} \therefore 1 - \frac{1}{10}$ or $\frac{9}{10} : 1 :: 15s. : \frac{10 \times 15}{9}s. = \frac{50}{3}s.$ cost price.

S. p. to gain 15 p.c. = $\frac{115 \times 50}{100 \times 3}s. = \frac{115}{6}s. = 19s. \text{ } 2d.$

95) 194|104|539 (579

125

$5^2 \times 300 = 7500$	69104
$5 \times 7 \times 30 = 1050$	
$7^2 = 49$	
8599	60193
$57^2 \times 300 = 974700$	
$57 \times 9 \times 30 = 15390$	
$9^2 = 81$	
990171	8911539

$$(96) \cdot 0021 = \frac{21}{9990}, \text{ and } 48 \cdot 026 = 48 \frac{26}{1000} = \frac{3602}{75}.$$

$$\therefore \frac{21}{9990} \times \frac{3602}{75} = \frac{13607}{134875} = \cdot 100956.$$

$$(97) \text{ Content of cistern} = (10^3 + 2) \text{ cub. in.} = 1008 \text{ cub. in.}$$

$$\text{Area of base} = \left(\frac{121}{81} - \frac{100}{81}\right) \text{ sq. ft.} = \frac{21}{81} \text{ sq. ft.} = \frac{11}{3} \text{ sq. in.}$$

$$\therefore \text{depth} = 1008 \div \frac{11}{3} = 27 \text{ in.} = 2 \text{ ft. } 3 \text{ in.}$$

$$(98) \text{ His rate against the stream is } \frac{10}{2\frac{1}{2}} \text{ or 4 miles per hour.}$$

He rows in still water 4 + 3 or 7 miles per hour.

\therefore with stream he rows 7 + 3 or 10 miles per hour.

\therefore he will row 5 miles with stream in $\frac{1}{2}$ hour or 30 minutes.

$$(99) \text{ Principal} = £1936 \text{ } 18s. - £207 \text{ } 10s. \text{ } 6d. = £1729 \text{ } 7s. \text{ } 6d. = £\frac{13935}{8}.$$

$$\frac{\frac{13935}{8} \times 3 \times R}{100} = 207\frac{21}{40} \therefore R = \frac{8301}{40} \times \frac{160}{8301} = 4 \text{ per cent.}$$

$$(100) \quad \begin{array}{l} 90 \text{ pioneers : } 48 \text{ pioneers} \\ 42 \text{ days : } 5 \text{ days} \end{array} \quad \left. \vphantom{\begin{array}{l} 90 \text{ pioneers : } 48 \text{ pioneers} \\ 42 \text{ days : } 5 \text{ days} \end{array}} \right\} \therefore 12\frac{1}{2} \text{ hours.}$$

$$139\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2} \text{ yds. : } 4910\frac{1}{16} \times 4\frac{7}{8} \times 3\frac{1}{2} \text{ yds.}$$

$$\text{Then } \frac{48 \times 5 \times 78561 \times 39 \times 16 \times 4 \times 2 \times 2 \times 25}{90 \times 42 \times 559 \times 9 \times 5 \times 16 \times 8 \times 5 \times 2} \text{ hrs.} = \frac{116}{3} \text{ hrs.} = 38\frac{2}{3} \text{ hrs.}$$

$$(101) 9 \text{ dys. } 14 \text{ hrs. : } 1 \text{ hr.} \therefore \frac{1 \times 2760}{230} \text{ mls.} = 12 \text{ miles, rate of steamer.}$$

$$18 \text{ hrs. : } 1 \text{ hr.} \therefore \frac{1 \times 405}{18} \text{ mls.} = \frac{45}{2} \text{ mls.} = 22\frac{1}{2} \text{ miles, rate of train.}$$

$$\therefore \text{steamer : train} \therefore 12 \text{ mls. : } 22\frac{1}{2} \text{ mls.}$$

$$(102) \sqrt{2515294} = \sqrt{\frac{808209}{361}} = \frac{284}{19} = 50\frac{3}{19}.$$

$$\begin{array}{r} 90 \overline{) 82 \overline{) 09} (953} \qquad \qquad \qquad 3 \overline{) 61} (19 \\ \underline{81} \qquad \qquad \qquad \underline{1} \\ 185) 982 \qquad \qquad \qquad 29) 261 \\ \underline{925} \qquad \qquad \qquad \underline{261} \\ 1903) 5709 \qquad \qquad \qquad \dots \\ \underline{5709} \\ \dots \end{array}$$

3)

$$\begin{array}{r|l}
 5 \cdot 780 \text{ (1} \cdot 794 \text{ \&c.)} & \\
 1 & \\
 \hline
 1^2 \times 300 = 300 & 4780 \\
 1 \times 7 \times 30 = 210 & \\
 7^2 = 49 & \\
 \hline
 559 & 3913 \\
 \hline
 17^2 \times 300 = 86700 & 867000 \\
 17 \times 9 \times 30 = 4590 & \\
 9^2 = 81 & \\
 \hline
 91371 & 822339 \\
 \hline
 179^2 \times 300 = 9612300 & 44661000 \\
 179 \times 4 \times 30 = 15480 & \\
 4^2 = 16 & \\
 \hline
 9627796 & 38511184 \\
 \hline
 & 6149816
 \end{array}$$

4)

$$\begin{array}{rcccc}
 \text{ft.} & \text{in.} & \text{pts.} & & \\
 3 & 1 & 11 & & \\
 2 & 6 & 7 & & \\
 \hline
 6 & 3 & 10 & & \\
 1 & 6 & 11 & 6 & \\
 & 1 & 10 & 1 & 5 \\
 \hline
 8 & 0 & 7 & 7 & 5 \\
 1 & 7 & & & \\
 \hline
 8 & 0 & 7 & 7 & 5 \\
 4 & 8 & 4 & 5 & 3 & 11 \\
 \hline
 12 & 9 & 0' & 0'' & 8''' & 11''''
 \end{array}$$

05) 12 ft. 9 in. 0' 0'' 8''' 11'''' = 12 ft. $1296\frac{107}{144}$ in.

$$\begin{array}{r}
 12 \\
 108 \\
 12
 \end{array}$$

$$1296\frac{107}{144} \text{ c. in. } \frac{8}{12} + \frac{11}{144} = \frac{107}{144}.$$

06) $4 \cdot 03 = 4\frac{1}{30} = \frac{121}{30}$, and $\cdot 1407 = \frac{1406}{9990}$.

$$\therefore \frac{121}{30} + \frac{1406}{9990} = \frac{121}{30} \times \frac{9990}{1406} = \frac{40283}{1406} = 28 \cdot 65789, \text{ \&c.}$$

07) $21 \cdot 6 + 73 \cdot 8 + 0 + 3 \cdot 065 + 82 + 17 \cdot 15 + 5 \cdot 25 + 9 \cdot 416 = 212 \cdot 3483$.

$$\therefore \text{average} = 212 \cdot 3483 \div 8 = 26 \cdot 5435416.$$

$$(108) \text{ £}98\frac{2}{3} : \text{£}2000 :: \text{£}3 : \frac{2000 \times 3 \times 8}{789} \text{ l.} = \text{£}1\frac{6000}{789} = \text{£}60 \text{ 16s. } 8\frac{200}{789} \text{ d.}$$

1st income.

$$\text{£}93\frac{1}{4} : \text{£}2000 :: \text{£}4\frac{1}{4} : \frac{2000 \times 17 \times 4}{375 \times 4} \text{ l.} = \text{£}1\frac{72}{3} = \text{£}90 \text{ 13s. } 4\text{d.}$$

2nd income.

$$\therefore \text{ difference} = \text{£}90 \text{ 13s. } 4\text{d.} - \text{£}60 \text{ 16s. } 8\frac{200}{789} \text{ d.} = \text{£}29 \text{ 16s. } 7\frac{63}{363} \text{ d.}$$

13

$$(109) P + \frac{P \times 5 \times 52}{100 \times 480} = \frac{41921}{80} \therefore P = \frac{41921}{80} \times \frac{2400}{2413} = \text{£}510.$$

$$\therefore \text{ discount} = \text{£}512 \text{ 15s. } 3\text{d.} - \text{£}510 = \text{£}2 \text{ 15s. } 3\text{d.}$$

$$(110) \left. \begin{array}{l} 1 : 4 \\ 1 : 5 \\ 3 : 2 \end{array} \right\} :: 5 \text{ men} \therefore \frac{4 \times 5 \times 2 \times 5}{3} \text{ men} = \frac{200}{3} \text{ or } 66\frac{2}{3} \text{ men.}$$

$$(111) \text{ Average width} = (8 + 6) \div 2 = 7 \text{ yds.}$$

$$\text{Time} = \frac{10 \times 1760 \times 7 \times 1\frac{2}{3}}{800 \times 15} \text{ dys.} = \frac{154}{9} \text{ dys.} = 17\frac{2}{9} \text{ days.}$$

$$(112) 100 : \frac{375}{10000} :: 1 \times 7 \times 24 \times 60 \text{ min.} : \frac{375 \times 7 \times 24 \times 60}{100} \text{ min.}$$

$$= \frac{189}{50} \text{ min.} = 3 \text{ min. } 46.8 \text{ sec.}$$

$$(113) 9\frac{1}{4} \text{ mls.} : 74 \text{ mls.} :: 1 \text{ hr.} : \frac{74 \times 1 \times 4}{37} \text{ hrs.} = 8 \text{ hours time taken}$$

by 1st vessel.

\therefore the 1st arrives at 4 p.m., and the 2nd at 3.55 p.m.

As speed of 1st vessel : 2nd as 8 : 5,

the time taken by second vessel = 5 hours.

\therefore the second vessel starts at 10.55 a.m.

$$(114) \frac{1}{4} \text{ is done by the soldiers and navvies in one day.}$$

$\frac{1}{4}$ is done by the soldiers and half the navvies in one day.

$\therefore \frac{1}{4} - \frac{1}{8} = \frac{1}{8}$ is done by half the navvies in one day.

$\therefore \frac{1}{8} \times 2 = \frac{1}{4}$ is done by the whole of the navvies in one day.

$\therefore \frac{1}{4} - \frac{1}{8} = \frac{1}{8}$ is done by the soldiers in one day.

$\therefore \frac{1}{8} \times 4 = \frac{1}{2}$ is done by the soldiers in 4 days.

15) $13.48 + 21 + 7.75 + .0023 + 0 + 106.5 + 57.35 = 209.2073$.

\therefore average $= 209.2073 \div 8 = 26.1509125$.

6) $1 - \frac{3}{50}$ or $\frac{47}{50} : 1 :: 15s. : \frac{50 \times 15}{47}s. = \frac{750}{47}s. = \text{cost price.}$

As $\frac{7}{40}$ is gained $\therefore 1 : 1\frac{7}{40} :: \frac{750}{47}s. : \frac{47 \times 750}{40 \times 47}s. = \frac{7}{4}s. = 18s. 9d. \text{ s.p.}$

7) Total age of the 32 candidates $= (20 \times 3) + (21 \times 4) + (22 \times 12) + (23 \times 12) + (24 \times 1) = 60 + 84 + 264 + 274 + 24 = 708$.

\therefore average age of each candidate $= 708 \div 32 = 22\frac{1}{8}$ years.

8) Cost price $= (4s. 6d. \times 3) + (3s. 6d. \times 2) = 13s. 6d. + 7s. = £1 0s. 6d.$

Selling price $= 4s. 4d. \times 5 = £1 1s. 8d.$

\therefore gain $= £1 1s. 8d. - £1 0s. 6d. = 1s. 2d.$

$£1 0\frac{1}{2}s. : 100 :: 1\frac{1}{2}s. : \frac{100 \times 7 \times 2}{6 \times 41} = \frac{700}{123} = 5\frac{85}{123} \text{ gain per cent.}$

9) $114.2 : 100 :: 21121290 : \frac{100 \times 21121290}{114.2} = 18495000$.

10) $£91 : £5460 :: £3 : \frac{5460 \times 3}{91}l. = £180 \text{ 1st income.}$

$£91 : £5460 :: £100 \text{ stk.} : \frac{5460 \times 100}{91}l. = £6000 \text{ stock.}$

$£100 \text{ stk.} : £2000 \text{ stk.} :: £93\frac{1}{2} : £1870$

$£100 \text{ stk.} : £4000 \text{ stk.} :: £85 : £3400$

$£5270 \text{ sterling.}$

$£102 : £5270 :: £4\frac{1}{2} : \frac{5270 \times 9}{102 \times 2}l. = \frac{£7905}{32} = £232 10s. \text{ 2nd}$

income.

\therefore increase $= £232 10s. - £180 = £52 10s.$

11) $\frac{10}{240} \times 6 = £\frac{1}{4} = \text{income tax on } £6$.

\therefore the net income received from £100 stock $= 6 - \frac{1}{4} = 5\frac{3}{4}$.

$6\frac{1}{2} : 5\frac{3}{4} :: 100 : \frac{23 \times 2 \times 100}{13 \times 4} = \frac{1150}{13} = 88\frac{6}{13}$.

22) Out of 100 persons 75 are Roman Catholics and 25 Protestants.

Out of these 25 Protestants 15 are members of the Established Church and 10 Dissenters \therefore the Roman Catholics are 75 to 10 of the Protestant Dissenters.

$75 : 10 :: 100 : 13\frac{1}{3}$.

$$(123) 3\frac{1}{4} : 4\frac{1}{2} :: 93 : \frac{9 \times 4 \times 93}{13 \times 2} = \frac{1874}{13} = 128\frac{10}{13}.$$

$$(124) £128\frac{1}{4} : £100 :: £6\frac{1}{2} : \frac{13 \times 100 \times 2}{2 \times 257} = 5\frac{15}{257} \text{ interest from } £100 \text{ of}$$

Midland stock.

$$£72\frac{1}{2} : £100 :: £3 : \frac{100 \times 3 \times 2}{145} = 4\frac{4}{29} \text{ interest from } £100 \text{ of}$$

Great Western stock.

$$\therefore \text{loss} = 5\frac{15}{257} - 4\frac{4}{29} = \frac{6860}{7453}.$$

$$5\frac{15}{257} : 100 :: \frac{6860}{7453} : \frac{257 \times 100 \times 6860}{1300 \times 7453} = \frac{6860}{877} = 18\frac{74}{877} \text{ loss per cent.}$$

$$(125) £70\frac{1}{2} : £5000 :: £100 \text{ stk.} : \frac{5000 \times 100 \times 2}{141} \text{ l.} = \frac{£1000000}{141}$$

= £7092 $\frac{28}{141}$ stock.

$$£5000 : \frac{£1000000}{141} :: £6 : \frac{1000000 \times 6}{5000 \times 141} \text{ l.} = \frac{£1200}{141} = 8\frac{24}{141} \text{ interest.}$$

$$(126) \text{ An income tax of } 10d. \text{ in the pound} = \frac{10}{240} = \frac{1}{24} \text{ of your income.}$$

$\frac{1}{24}$ of £3 = £ $\frac{1}{8}$ = the income tax on £3.

$$\therefore \text{the net income received from } £100 \text{ stock} = £3 - \frac{1}{8} = £2\frac{7}{8}.$$

$$3\frac{1}{2} : 2\frac{7}{8} :: 100 : \frac{23 \times 2 \times 100}{7 \times 8} = \frac{575}{7} = 82\frac{1}{7}.$$

$$(127) \text{ See 'Lupton's Arithmetic,' pp. 123 and 124.}$$

EXERCISE LXIX., p. 144.

$$(1) £4651143 \text{ 2s.}$$

$$(2) £5149668 \text{ 12s. 2d.}$$

EXERCISE LXX., p. 145.

$$(1) 24 \left\{ \begin{array}{l} \frac{6) 3660607 \text{ grs.}}{4) 610101 \text{ . 1}} \\ 2,0) 15252,5 \text{ . 1} \end{array} \right\} 7 \text{ grs.}$$

$$12) 7628 \text{ . 5 dwts.}$$

$$635 \text{ lbs. 6 oz. 5 dwts. 7 grs.}$$

$$(2) £14 \text{ 3}\frac{1}{2}\text{s.} : £23 \text{ 12}\frac{1}{2}\text{s.} :: 3 \text{ cwt. 69 lbs.} : \frac{945 \times 405}{567} \text{ lbs.} = 675 \text{ lbs.}$$

= 6 cwt. 3 lbs.

(3) 10 dwts.	$\frac{1}{2}$	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 2 \quad 10 \quad 0 \\ \hline 3 \\ \hline 7 \quad 10 \quad 0 \end{array}$	(4) 4A. 3R. 16P. to sq. ft.
5 dwts.	$\frac{1}{2}$	$\begin{array}{r} 1 \quad 5 \quad 0 \\ \hline 12 \quad 6 \end{array}$	$\begin{array}{r} 4 \\ \hline 19R. \\ 40 \end{array}$
1 dwt.	$\frac{1}{2}$	$\begin{array}{r} 2 \quad 6 \\ \hline 30\frac{1}{4} \end{array}$	$\begin{array}{r} 776 \text{ pls.} \\ 30\frac{1}{4} \end{array}$
12 grs.	$\frac{1}{2}$	$\begin{array}{r} 1 \quad 3 \\ \hline 3\frac{1}{4} \end{array}$	$\begin{array}{r} 23280 \\ 194 \end{array}$
3 grs.	$\frac{1}{4}$	$\begin{array}{r} 3\frac{1}{4} \\ \hline \text{£9 } 11\text{s. } 6\frac{1}{4}\text{d.} \end{array}$	$\begin{array}{r} 23474 \text{ yds.} \\ 9 \end{array}$
			$\begin{array}{r} 211266 \text{ ft.} \end{array}$

(5) Taxes = £285 4s. - £467 7s. 6d. = £17 16s. 6d.

$$\text{£}285\frac{1}{2} : \text{£}1 :: \text{£}17 \text{ 16s. 6d.} : \frac{1 \times 4278 \times 5}{1426} \text{d.} = 15\text{d.} = 1\text{s. 3d.}$$

(6) 2 qrs.	$\frac{1}{2}$	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 2 \quad 5 \quad 6 \\ \hline 6 \\ \hline 13 \quad 13 \quad 0 \end{array}$	(7) 6,0) 443300,7 seconds.
1 qr.	$\frac{1}{2}$	$\begin{array}{r} 1 \quad 2 \quad 9 \\ \hline 11 \quad 4\frac{1}{2} \end{array}$	$\begin{array}{r} 6,0) 7388,3 \text{ . 27 sec.} \\ 24 \left\{ \begin{array}{l} 6) 1231 \text{ . 23 min.} \\ 4) 205 \text{ . 1} \\ 7) 51 \text{ . 1} \end{array} \right\} 7 \text{ hrs.} \end{array}$
14 lbs.	$\frac{1}{2}$	$\begin{array}{r} 5 \quad 8\frac{1}{4} \\ \hline \text{£15 } 12\text{s. } 9\frac{1}{4}\text{d.} \end{array}$	$\begin{array}{r} 7 \text{ wks. 2 dys. 7 hrs} \\ 23 \text{ min. 27 sec.} \end{array}$

$$(8) 9d. - 7d. \text{ or } 2d. : \text{£}84 \text{ 7s. 6d.} :: \text{£}1 : \frac{20250d. \times 1}{2} l. = \text{£}10125.$$

(9)	1R.	$\frac{1}{4}$	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 4 \quad 0 \quad 0 \\ \hline 5 \\ \hline 20 \quad 0 \quad 0 \end{array}$
	10P.	$\frac{1}{4}$	$\begin{array}{r} 1 \quad 0 \quad 0 \\ \hline 5 \quad 0 \end{array}$
	2P.	$\frac{1}{8}$	$\begin{array}{r} 1 \quad 0 \\ \hline 6 \end{array}$
	1P.	$\frac{1}{2}$	$\begin{array}{r} 6 \\ \hline \text{£21 } 6\text{s. } 6\text{d.} \end{array}$

$$(10) \begin{array}{l} 1728 \left\{ \begin{array}{l} 144 \left\{ \begin{array}{l} (12) \overline{1000000} \text{ cub. in.} \\ (12) \overline{83333} \cdot 4 \\ (12) \overline{6944} \cdot 5 \end{array} \right\} 64 \\ 27 \left\{ \begin{array}{l} (9) \overline{578} \cdot 8 \\ (3) \overline{64} \cdot 2 \\ 21 \quad 1 \end{array} \right\} 11 \text{ c. ft.} \end{array} \right\} (8 \times 144) + 64 = 1216 \text{ c. in.} \end{array}$$

21 c. yds. 11 c. ft. 1216 c. in.

$$(11) 7\frac{1}{2} \text{ bus.} : 1\frac{1}{2} \text{ bus.} :: £3 \text{ 5s. 5d.} : \frac{3 \times 785}{15} \text{ d.} = 157 \text{ d.} = 13 \text{ s. 1d.}$$

$$(12) \begin{array}{r|l} \begin{array}{l} 2 \text{ dys.} \\ 6 \text{ hrs.} \\ 4 \text{ hrs.} \\ 1 \text{ hr.} \end{array} & \begin{array}{l} \frac{1}{3} \\ \frac{1}{4} \\ \frac{1}{3} \\ \frac{1}{4} \end{array} \end{array} \begin{array}{r} \begin{array}{c} £ \quad s. \quad d. \\ 1 \quad 16 \quad 0 \\ \hline 3 \\ 5 \quad 8 \quad 0 \\ 12 \quad 0 \\ 3 \quad 0 \\ 2 \quad 0 \\ \hline 6 \end{array} \\ £6 \quad 5 \text{ s. } 6 \text{ d.} \end{array}$$

EXERCISE LXXI., p. 145.

$$(1) \begin{array}{l} 24 \left\{ \begin{array}{l} (4) \overline{4005201} \text{ grs. Troy.} \\ (6) \overline{1001300} \cdot 1 \\ 2,0) \overline{16688,3} \cdot 2 \end{array} \right\} 9 \text{ grs.} \\ 12) \overline{8344} \cdot 3 \text{ dwts.} \end{array}$$

695 lbs. 4 oz. 3 dwts. 9 grs.

$$(2) 2\frac{1}{2} \times 20 \text{ cwt.} : 1\frac{1}{2} \text{ cwt.} :: £3\frac{1}{8} : \frac{3 \times 2 \times 25}{5 \times 20 \times 2 \times 8} \text{ l.} = £\frac{3}{8} = 1 \text{ s. } 10\frac{1}{2} \text{ d.}$$

$$(3) \begin{array}{r|l} \begin{array}{l} 2 \text{ bus.} \\ 1 \text{ gal.} \end{array} & \begin{array}{l} \frac{1}{4} \\ \frac{1}{16} \end{array} \end{array} \begin{array}{r} \begin{array}{c} £ \quad s. \quad d. \\ 2 \quad 13 \quad 4 \\ \hline 3 \\ 8 \quad 0 \quad 0 \\ 13 \quad 4 \\ \hline 10 \end{array} \\ £8 \quad 14 \text{ s. } 2 \text{ d.} \end{array}$$

$$(4) \text{ Interest} = \frac{667 \times 20 \times 15}{100 \times 2 \times 4} \text{ l.} = \text{£} \frac{2001}{8} = \text{£}250 \text{ 2s. 6d.}$$

$$(5) \frac{1}{8} + \frac{7}{32} + \frac{3}{16} + \frac{1}{2} = \frac{8+7+12+32}{64} = \frac{59}{32}.$$

$$(6) 2\frac{1}{3} - \frac{25}{27} = 2\frac{9-25}{27} = 1\frac{11}{27}.$$

$$(7) \frac{2}{1\frac{1}{2}} \times \frac{80}{17} = \frac{8}{17}.$$

$$(8) \frac{7}{25} + 5\frac{1}{5} = \frac{7}{25} \times \frac{5}{5} = \frac{7}{125}.$$

$$(9) 407.755812.$$

$$(10) 33.934899.$$

$$(11) \begin{array}{r} 7840.6 \\ 20.471 \\ \hline 78406 \\ 548842 \\ 313624 \\ \hline 156812 \\ \hline 160504.9226 \end{array}$$

$$(12) \begin{array}{r} 61.25 \quad 7.012 \quad (.1144 \text{ \&c.}) \\ 6125 \\ \hline 8870 \\ 6125 \\ \hline 27450 \\ 24500 \\ \hline 29500 \\ 24500 \\ \hline 5000 \end{array}$$

$$(13) \begin{array}{r} 2.003125 \text{ of } \text{£}8 \\ 8 \\ \hline \text{£}16.025000 \\ 20 \\ \hline 0.5000\text{s.} \\ 12 \\ \hline 6.0d. \\ \text{£}16 \text{ 0s. 6d.} \end{array}$$

$$(14) \begin{array}{r} 12) 4533206 \text{ in.} \\ 3) 377767 \text{ . 2 in.} \\ \hline 125922 \text{ . 1 ft.} \\ 2 \\ \hline 11) 251844 \\ 4,0) 2289,4 \text{ . 10 h. yds.} = 5 \text{ yds.} \\ 8) 572 \text{ . 14 pls.} \\ \hline 71 \text{ mls. 4 fur. 14p.} \\ 5 \text{ yds. 1 ft. 2 in.} \end{array}$$

$$(15) 8 \text{ ft.} : 24 \text{ ft.} :: 48 \text{ ft.} : \frac{24 \times 48}{8} \text{ ft.} = 144 \text{ ft.}$$

(16)	10 dwts.	$\frac{1}{2}$	$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 3 \quad 10 \quad 0 \\ \hline 7 \\ \hline 24 \quad 10 \quad 0 \\ 1 \quad 15 \quad 0 \\ 7 \quad 0 \\ 3 \quad 6 \\ 1 \quad 9 \\ \hline 5\frac{1}{4} \end{array}$
	2 dwts.	$\frac{1}{5}$	
	1 dwt.	$\frac{1}{3}$	
	12 grs.	$\frac{1}{2}$	
	3 grs.	$\frac{1}{4}$	
			$\text{£}26 \ 17\text{s.} \ 8\frac{1}{4}\text{d.}$

$$(17) 4\frac{1}{2} \text{ p.c.} = \frac{9}{200} \therefore M = (1\frac{9}{200})^4 \times \text{£}10.$$

$$M = \frac{209}{200} \times \frac{209}{200} \times \frac{209}{200} \times \frac{209}{200} \times \frac{10}{1} = \frac{\text{£}1908029761}{160000000} = \text{£}11 \ 18\text{s.} \ 6\text{d.}$$

$$(18) \frac{5}{3} + \frac{500}{33} + \frac{13}{330} = \frac{550 + 5000 + 13}{330} = \frac{5563}{330} = 16\frac{283}{330}.$$

$$(19) 3\frac{191}{360} - 2\frac{21}{40} = 1 - \frac{181 - 279}{360} = \frac{282}{360} = \frac{131}{180}.$$

$$(20) \frac{53}{84} \times \frac{105}{1572} = \frac{365}{8288}.$$

$$(21) 3\frac{4}{7} \div \frac{25}{42} = \frac{25}{7} \times \frac{42}{25} = 6.$$

$$(22) 8004 \cdot 709485.$$

$$(23) 11 \cdot 57294.$$

$$(24) \begin{array}{r} \cdot 17034 \\ 8572 \\ \hline 34068 \\ 119238 \\ 85170 \\ \hline 136272 \\ \hline 1460 \cdot 15448 \end{array}$$

$$(25) \begin{array}{r} \cdot 049 \ 5 \cdot 008 \ (102 \cdot 204 \ \&c. \\ 49 \\ \hline 108 \\ 98 \\ \hline 100 \\ 98 \\ \hline 200 \\ 196 \\ \hline 4 \end{array}$$

$$(26) \text{As } 1 \text{ lb.} = 240 \text{ dwts.} \therefore \frac{2}{3} \div 240 = \frac{2}{3} \times \frac{1}{240} = \frac{1}{360} = \cdot 002\bar{7}.$$

$$(27) \quad 1\text{A. } 3\text{R. } 5\text{P. to sq. ft.}$$

$$\begin{array}{r} 4 \\ \hline 7\text{R.} \\ 40 \\ \hline 285\text{P.} \\ 30\frac{1}{4} \\ \hline 8550 \\ 71\frac{1}{4} \\ \hline 8621\frac{1}{4} \text{ yds.} \\ 9 \\ \hline 77591\frac{1}{4} \text{ ft.} \end{array}$$

$$(28) \text{ £}2\frac{2}{3} : \text{£}2\frac{1}{2} :: 188\text{A} : \frac{5 \times 188 \times 3}{2 \times 8} \text{A} = \frac{705}{4} \text{A} = 176\frac{1}{4} \text{ acres.}$$

(29)	3 dys.	$\frac{1}{2}$	£	s.	d.
			1	16	0
					2
			3	12	0
	1 dy.	$\frac{1}{3}$		18	0
	6 hrs.	$\frac{1}{2}$		6	0
	4 hrs.	$\frac{1}{3}$		3	0
				2	0
			£5 1s. 0d.		

$$(30) \text{ Interest} = \text{£}712 \text{ 16s.} - \text{£}540 = \text{£}172 \text{ 16s.} = \text{£}2\frac{864}{5}.$$

$$\frac{540 \times 4 \times N}{100} = \frac{864}{5} \therefore N = \frac{864}{5} \times \frac{10}{216} = 8 \text{ years.}$$

$$(31) 9 + 2\frac{3}{4} + \frac{211}{27} + \frac{1}{54} = 11 \frac{81 + 844 + 2}{108} = 11 \frac{927}{108} = 19\frac{7}{12}.$$

$$(32) 10\frac{1}{35} - 2\frac{1}{18} = 8\frac{1-3}{39} = 7\frac{37}{39}. \quad (33) \frac{5}{168} \times \frac{52}{12} \times \frac{2}{1} = 1.$$

$$(34) 300\frac{3}{8} + 15 = \frac{2403}{8} \times \frac{1}{15} = \frac{801}{40} = 20\frac{1}{40}.$$

$$(35) 20135 \cdot 2652434.$$

$$(36) \cdot 005899.$$

$$(37) \begin{array}{r} 8892 \\ \cdot 002453 \\ \hline 26676 \\ 44460 \\ 35568 \\ 17784 \\ \hline 21 \cdot 812076 \end{array}$$

$$(38) \begin{array}{r} \cdot 001125) 15483 \cdot 2 \quad (13762844 \cdot 4 \\ \hline 1125 \end{array}$$

$$\begin{array}{r} 4233 \\ 3375 \\ \hline 8582 \\ 7875 \\ \hline 7070 \\ 6750 \\ \hline 3200 \\ 2250 \\ \hline 9500 \\ 9000 \\ \hline 5000 \\ 4500 \\ \hline 5000 \\ 4500 \\ \hline 5000 \\ 4500 \\ \hline 500 \end{array}$$

$$(39) 3\frac{1}{2} \text{ g.} + \text{£}2 \text{ 15s.} = \frac{15}{4} \times \frac{21}{1} \times \frac{1}{55} = \frac{63}{44} = 1 \cdot 4318.$$

EXERCISE LXXII., p. 147.

(1)

$$\begin{array}{r}
 6\overline{)76} \mid 20\overline{)80} \mid 16 \text{ (26.004)} \\
 \underline{4} \\
 46 \overline{)276} \\
 \underline{276} \\
 52004 \overline{)208016} \\
 \underline{208016} \\
 \text{.....}
 \end{array}$$

66\overline{)923} \mid 396 \text{ (4.06 nearly.}

64

$40^2 \times 300 = 480000$ $40 \times 30 \times 6 = 7200$ $6^2 = 36$ <hr style="border: none; border-top: 1px solid black;"/> 487236	2923396 <hr style="border: none; border-top: 1px solid black;"/> 2923416
---	---

$$(2)^* P + \frac{P \times 43 \times \frac{1}{4}}{100 \times \frac{8}{2}} = \frac{2115}{4} \therefore P = \frac{2115}{4} \times \frac{200}{243} = \frac{£11750}{27} = £435 \text{ 3s. } 8\frac{4}{9}d. \text{ P.W}$$

$$\therefore \text{discount} = £528 \text{ 15s.} - £434 \text{ 3s. } 8\frac{4}{9}d. = £93 \text{ 11s. } 3\frac{5}{9}d.$$

$$(3) \text{ Average} = (12.48 + 21 + 7.75 + .034 + 3.125 + 24.5 + 12.35) \div 8 = 10.154875.$$

$$(4) 1 - \frac{4}{25} \text{ or } \frac{21}{25} : 1 :: £136 : \frac{136 \times 25}{21} l. = \frac{£3400}{21} \text{ cost price.}$$

$$\text{Gain} = £168 - \frac{£3400}{21} = \frac{£128}{21}.$$

$$\therefore \text{gain per cent.} = \frac{100 \times 128}{3400} = \frac{64}{17} = 3\frac{13}{17}.$$

$$(5) (\frac{5}{32} \times \frac{840}{1} = 100A.) + \frac{7}{10}A. + (\frac{5}{8} \times \frac{1}{4} = \frac{5}{32}A.) = 100 + \frac{7}{10} + \frac{5}{32} = 100\frac{137}{160} \text{ acr} = 100A. \text{ 3R. 17P.}$$

$$(6) £90 : £6534 :: £3 : \frac{6534 \times 3}{90} l. = \frac{£1089}{5} = £217 \text{ 16s. 1st income.}$$

$$£90 : £6534 :: £1 : \frac{6534 \times 1}{90} l. = \frac{£263}{5} = £72\frac{3}{5} \text{ gain.}$$

$$£93\frac{1}{2} : £6534 + £72\frac{3}{5} \text{ or } £6606\frac{3}{5} :: £3\frac{1}{2} : \frac{33033 \times 7 \times 2}{187 \times 2 \times 5} l. = \frac{£21021}{85}$$

$$= £247 \text{ 6s. } 1\frac{1}{17}d. \text{ 2nd income.}$$

$$\therefore \text{difference} = £247 \text{ 6s. } 1\frac{1}{17}d. - £217 \text{ 16s.} = £29 \text{ 10s. } 1\frac{1}{17}d.$$

* See Arithmetic, p. 101.

- (7) First duty = 7200000 qrs. $\times 16\frac{1}{2}s.$ = £5940000.

Duty after reduction and increase in consumption

$$= \frac{5940000 \times 70 \times 120}{100 \times 100} = £4989600.$$

$$\therefore \text{difference to revenue} = £5940000 - £4989600 = £950400.$$

- (8) Difference = 365 dys. 6 hrs. 9 min. 9.6 sec. - 365 dys. 5 hrs. 48 min. 49.7 sec. = 20 min. 19.6 sec.

$$\text{Then } \frac{20 \text{ min. } 19.6 \text{ sec.}}{365 \text{ dys. } 6 \text{ hrs. } 9 \text{ min. } 9.6 \text{ sec.}} = \frac{1219.9}{31558149.6} = .00003 \text{ \&c.}$$

- (9) 16 men do $\frac{1}{3}$ of $\frac{1}{2}$ or $\frac{1}{6}$ in 16 days.

\therefore 16 men do $\frac{1}{4}$ in 24 days.

$$\frac{1}{4} : \frac{1}{2} :: 16 : 32.$$

$$\text{Expenses of 1st half} = \frac{32 \times 24 \times 3}{2 \times 20} l. = £57\frac{3}{5}.$$

$$\text{„ 2nd „} = \frac{48 \times 16 \times 3}{2 \times 20} l. = £57\frac{3}{5}.$$

$$\therefore \text{total expenditure} = £57\frac{3}{5} + £57\frac{3}{5} = £115\frac{1}{5}.$$

	ft.	in.	
(10)	13	7	
	9	3	
	122	3	
	3	4	9
	125	7	9
	2	5	
	251	3	6
	52	4	2
	303	7	8'
			9" = 11 yds. 6 ft. 1113 in.
		12	
		92	
		12	
			1113 in.

- (11) Area of walls = $2(34.8 + 13.6) \times 10.5$.

$$\therefore \text{cost of papering} = \frac{1}{3} \{ (96\frac{1}{3} \times 10\frac{1}{2} \div 1\frac{5}{8}) \times 6d. = \frac{1}{3} \times \frac{288}{3} \times \frac{43}{4} \times \frac{6}{1} \times \frac{6}{11} \\ = \frac{12427}{11} d. = £4 \text{ } 14s. \text{ } 1\frac{9}{11}d.$$

$$\text{Cost of carpeting} = \frac{1}{2} (34\frac{2}{3} \times 13\frac{1}{2} \times 40\frac{1}{2}d.) \div \frac{1}{4} \text{ yd.} = \frac{1}{2} \times \frac{194}{3} \times \frac{27}{2} \times \frac{61}{2} \times \frac{4}{3} \\ = 2808d. = £11 \text{ } 14s.$$

$$(12) \ 5 \frac{1183}{10000} \times \frac{10000}{41} \times 22 \frac{2}{5} \times \frac{1}{10} \times \frac{232}{550} = \frac{51183}{10000} \times \frac{10000}{141} \times \frac{290}{5} \times \frac{1}{10} \times \frac{23}{99} \\ = 189 \frac{1}{57}.$$

EXERCISE LXXIII., p. 148.

(1) 41033

2050

38985

16572

55555 = fifty-five thousand five hundred and fifty-three.

(2) i. $3003 \times 79000 = 237237000$. ii. $10897080 \div 120 = 908090$

iii. $51488703 + 567 = 90809$.

(3) £200 13s. $2\frac{1}{2}d.$ + £23 5s. $1\frac{1}{4}d.$ + £195 9s. $3\frac{1}{2}d.$ + £8 10s. $1\frac{1}{2}d.$ + £127 2s. $5d.$ = £555 0s. $1d.$

(4) £25 16s. $4d.$ - £21 11s. $11\frac{3}{4}d.$ = £4 4s. $4\frac{1}{4}d.$

(5) See 'Lupton's Arithmetic,' p. 4.

	dwts.	grs.		tons	cwt.	qrs.	lbs.	oz.	drs.	cwt	
(6)	2	2	× 101	69)	10	8	3	11	12	15	(3
			10					20			
oz.			<hr/> 20					208			
1	0		20					207			
			<hr/> 10					1			
10	8		8					4			
			<hr/> 2					7			
10	10		10					28			
								207			
								207			
								<hr/> 12			
								16			
								207			
								207			
								<hr/> ...			

(7) February 29 + March 31 + April 30 + May 31 + June 30 +
= 182 days.

$$(8) \quad 1 \text{ c. yd. } 24 \text{ c. ft. } 760 \text{ c. in.}$$

$$\begin{array}{r} 27 \\ \hline 51 \text{ c. ft.} \\ 1728 \\ \hline 1728 \\ 8640 \\ \hline 760 \\ \hline 8888 \text{ c. in.} \end{array}$$

$$(9) \quad 4 \times 112 \text{ lbs.} : 1 \text{ lb.} :: 16 \times 21 \times 12d. : \frac{1 \times 16 \times 21 \times 12}{4 \times 112}d. = 9d.$$

$$(10) \quad 78 \text{ mls.} : 60 \text{ mls.} :: 13 \text{ hrs.} : \frac{60 \times 13}{78} \text{ hrs.} = 10 \text{ hours.}$$

EXERCISE LXXIV., p. 149.

$$(1) \quad 3 \text{ qrs. } 19 \text{ lbs.} \times 53 : 17 \text{ lbs.} :: £749 \text{ } 12s. \text{ } 3d. : \frac{17 \times 179907}{103 \times 53}d. \\ = \frac{3058419}{5459}d. = £2 \text{ } 6s. \text{ } 8\frac{1379}{5459}d.$$

$$(2) \quad \frac{1\frac{4}{17} \times 6\frac{4}{5}}{3\frac{3}{5} - 1\frac{2}{25}} + \frac{2}{11} \text{ of } (2\frac{2}{5} - \frac{3}{4}) - \frac{1\frac{3}{8}}{12} = \frac{\frac{42}{5}}{\frac{63}{25}} + \frac{3}{10} - \frac{\frac{9}{8}}{12} = \frac{10}{3} + \frac{3}{10} - \frac{2}{15} \\ = \frac{100 + 9 - 4}{30} = \frac{105}{30} = 3\frac{15}{30} = 3\frac{1}{2}.$$

$$(3) \quad \text{i. } 1\cdot00025 \times 2400 = 2400\cdot6. \quad \text{ii. } 3075 + \cdot125 = 24600. \\ \text{iii. } \cdot1590 \times \cdot472 + 2\cdot7 = \frac{7}{44} \times \frac{17}{36} + \frac{25}{9} = \cdot02704\bar{5}.$$

$$(4) \quad \frac{2}{9} \text{ of } 99 \times 24 \text{ grs.} \div 2\frac{2}{3} \text{ of } 405 \text{ grs.} = \frac{2 \times 99 \times 24 \times 3}{9 \times 8 \times 405} = \frac{22}{15} = \cdot4\bar{6}.$$

$$(5) \quad \left. \begin{array}{l} £125 : £200 \\ 3 \text{ yrs.} : 5 \text{ yrs.} \end{array} \right\} :: £13\frac{1}{8}. \quad \text{Then } \frac{200 \times 5 \times 105}{125 \times 3 \times 8}l. = £35.$$

$$(6) \quad \text{Area of field} = 1 \text{ fur. } 20p. \times 10p. \text{ } 1 \text{ yd.} = \frac{42}{11} \text{ acres.}$$

$$1A. : \frac{42}{11}A. :: £1 \text{ } 13s. : \frac{42 \times 33}{11}s. = 126s. = £6 \text{ } 6s.$$

EXERCISE LXXV., p. 149.

- (1) 7000 grs. Troy = 1 lb. Av.

$$1 \text{ cwt. } 1 \text{ qr. } 2 \text{ lbs. } 11\frac{3}{7} \text{ oz.} = \frac{15984}{16 \times 7} \text{ lbs.}$$

$$\therefore \frac{15984}{16 \times 7} \times \frac{7000}{1} = 999000 \text{ grains.}$$

- (2) £21544 14s. 2½d. + 97 = £222 2s. 2½d.

(3)	2 pks.	<table style="border-collapse: collapse;"> <tr> <td style="padding: 0 5px;">½</td> <td style="border-right: 1px solid black; padding: 0 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="text-align: right; padding: 2px 5px;">£</td> <td style="text-align: right; padding: 2px 5px;">s.</td> <td style="text-align: right; padding: 2px 5px;">d.</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">29</td> <td style="text-align: right; padding: 2px 5px;">16</td> <td style="text-align: right; padding: 2px 5px;">6</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; text-align: right; padding: 2px 5px;">10</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">298</td> <td style="text-align: right; padding: 2px 5px;">5</td> <td style="text-align: right; padding: 2px 5px;">0</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">14</td> <td style="text-align: right; padding: 2px 5px;">18</td> <td style="text-align: right; padding: 2px 5px;">3</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; text-align: right; padding: 2px 5px;">£313 3s. 3d.</td> </tr> </table> </td> </tr> </table>	½	<table style="border-collapse: collapse;"> <tr> <td style="text-align: right; padding: 2px 5px;">£</td> <td style="text-align: right; padding: 2px 5px;">s.</td> <td style="text-align: right; padding: 2px 5px;">d.</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">29</td> <td style="text-align: right; padding: 2px 5px;">16</td> <td style="text-align: right; padding: 2px 5px;">6</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; text-align: right; padding: 2px 5px;">10</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">298</td> <td style="text-align: right; padding: 2px 5px;">5</td> <td style="text-align: right; padding: 2px 5px;">0</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">14</td> <td style="text-align: right; padding: 2px 5px;">18</td> <td style="text-align: right; padding: 2px 5px;">3</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; text-align: right; padding: 2px 5px;">£313 3s. 3d.</td> </tr> </table>	£	s.	d.	29	16	6	10			298	5	0	14	18	3	£313 3s. 3d.		
½	<table style="border-collapse: collapse;"> <tr> <td style="text-align: right; padding: 2px 5px;">£</td> <td style="text-align: right; padding: 2px 5px;">s.</td> <td style="text-align: right; padding: 2px 5px;">d.</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">29</td> <td style="text-align: right; padding: 2px 5px;">16</td> <td style="text-align: right; padding: 2px 5px;">6</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; text-align: right; padding: 2px 5px;">10</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">298</td> <td style="text-align: right; padding: 2px 5px;">5</td> <td style="text-align: right; padding: 2px 5px;">0</td> </tr> <tr> <td style="text-align: right; padding: 2px 5px;">14</td> <td style="text-align: right; padding: 2px 5px;">18</td> <td style="text-align: right; padding: 2px 5px;">3</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; text-align: right; padding: 2px 5px;">£313 3s. 3d.</td> </tr> </table>	£	s.	d.	29	16	6	10			298	5	0	14	18	3	£313 3s. 3d.					
£	s.	d.																				
29	16	6																				
10																						
298	5	0																				
14	18	3																				
£313 3s. 3d.																						

- (4) i. 44)
- $\frac{1892}{1358} = \frac{43}{32}$
- .

$$\text{ii. } 3\frac{1}{2} + \frac{1\frac{1}{2}}{\frac{3}{20}} = \frac{10}{3} \times \frac{16}{1} \times \frac{3}{40} = 4.$$

- (5) $\frac{7}{18}$ of £5 = $\frac{7}{18}$ of $\frac{5 \times 240}{1} = 525d.$; $\frac{2}{3}$ of £9 13s. 2½d. = $\frac{2}{3}$ of $9\frac{275}{4}$
 $= 1325d.$; $\frac{5}{12}$ of 2s. 6d. = $\frac{5}{12}$ of $30 = 12\frac{1}{2}d.$
 $\therefore \text{sum} = 525 + 662\frac{1}{2} + 12\frac{1}{2} = 1200d. = £5.$

- (6) i. 1215013·8 ÷ 2·023 = 600600. ii. ·000072072 ÷ ·000012 = 6·0

- (7) $\frac{4 \text{ oz. } 7\frac{1}{2} \text{ dwts.}}{5 \text{ oz.}} = \frac{\frac{175}{2}}{5 \times 20} \text{ dwts.} = \frac{175}{2} \times \frac{1}{100} = \frac{7}{8}.$

$$\begin{array}{r} 12) 7\cdot5 \\ 100) 14\cdot625 \\ \hline \cdot14625 \end{array}$$

- (8) i. 1·01 = $1\frac{1}{90}$. ii. $27\cdot36 + 3\cdot109 = 27\frac{9}{25} + 3\frac{6}{55} = \frac{684}{25} \times \frac{55}{171} = \frac{44}{3} = 8$

- (9) Weight of 1 cub. ft. of marble = 1000 × 2·716 = 2716 oz.

$$\therefore \text{weight of block} = \frac{2716}{1} \times 9\frac{1}{2} \times 2\frac{1}{4} \times 2 = 116109 \text{ oz.} = 3 \text{ tons } 4 \text{ cw } 3 \text{ qrs. } 4 \text{ lbs. } 13 \text{ oz.}$$

- (10) Area of court = $\frac{1296}{1} \times \frac{19}{2} \times \frac{2}{2} = 324 \times 19 \times 9 \text{ in.}$
 Area of $\frac{1}{9}$ of the court = $324 \times 19 \text{ in.}$

$$\therefore \text{number of tiles} = \frac{324 \times 19}{6 \times 6} = 171.$$

- (11) See 'Lupton's Arithmetic,' p. 101.

$$3\frac{1}{2} : 3\frac{1}{4} :: 100 : \frac{13 \times 2 \times 100}{7 \times 4} = \frac{650}{7} = 92\frac{6}{7}.$$

\therefore the $3\frac{1}{4}$ per Cents at $92\frac{6}{7}$ are the most advantageous to invest in.

EXERCISE LXXVI., p. 150.

(1) 443206; 223130.

(2) i. $2468 \times 3057 = 7544676$. ii. $7544676 + 3702 = 2038$.

(3) $\frac{1}{8} + \frac{2}{9} = \frac{3+4}{18} = \frac{7}{18}$. $\frac{2}{9} - \frac{1}{8} = \frac{4-3}{18} = \frac{1}{18}$. $\frac{7}{18} + \frac{1}{18} = \frac{7}{18} \times \frac{18}{1} = 7$.

(4) Whole cost = $(17s. 9d. \times 27) + (£1 \ 2s. 6d. \times 12) + (19s. 4d. \times 11)$
 $= £23 \ 19s. 3d. + £13 \ 10s. + £10 \ 12s. 8d. = £48 \ 1s. 11d.$

5s.	$\frac{1}{4}$	65 @ £2 7s. per rod.
	2	
	130	
2s.	$\frac{1}{10}$	16 5
		6 10
		£152 15s.

(6) $18 \times 8 \text{ pts.} : 11 \text{ pts.} :: £1 \ 1s. : \frac{11 \times 21}{18 \times 8} s. = \frac{77}{8} s. = 1s. 7\frac{1}{8}d.$

(7) $10.8528 \div 1.02 = 10.64 = 10\frac{84}{100} = 10\frac{21}{25}.$

(8) Area = 3A. 1R. 13P. $5\frac{1}{2}$ yds. = 16129 yds.

$$\therefore \text{side} = \sqrt{16129} = 127 \text{ yds.}$$

(9) $P + \frac{P \times 9 \times 1}{100 \times 2} = 325 \therefore P = \frac{325}{1} \times \frac{200}{209} = £\frac{65000}{209} = £311 \ 0s. 1\frac{31}{209}d.$

(10) $\left. \begin{array}{l} 4 \text{ qrs.} : 5 \text{ qrs.} \\ 60s. : 50s. \end{array} \right\} :: £148.$

$$\text{Then } \frac{5 \times 50 \times 148}{60 \times 4} l. = £\frac{925}{6} = £154 \ 3s. 4d.$$

(11) $£3000 + £1200 + £2000 = £6200.$

$$\text{Share of 1st} = \frac{3000}{6200} \text{ of } £44 = £360. \quad \text{Share of 2nd} = \frac{1200}{6200} \text{ of } £44 = £144.$$

$$\text{Share of 3rd} = \frac{2000}{6200} \text{ of } £44 = £240.$$

- (12) As £90 : £900 :: £3 : $\frac{900 \times 3}{90}l = £30$ gain by investment.
 \therefore income at end of 1st year = £30 + £900 + £1000 = £1930.
 Sum invested = £1930 - ($\frac{1}{10}$ of £1930) = £1737.
 As £90 : £1737 :: £3 : $\frac{1737 \times 3}{90}l = £57$ 18s. gain by investment.
 \therefore income at end of two years = £57 18s. + £1737 + £1000
 = £2794 18s.
 Sum invested = £2794 18s. - ($\frac{1}{10}$ of £2794 18s.) = £2515 8s. $2\frac{2}{5}d$.
 As £90 : £2515 8s. $2\frac{2}{5}d$:: £3 : $\frac{3018492 \times 3}{90 \times 240 \times 5}l = £83$ 16s. $11\frac{7}{25}d$.
 gain by investment.
 \therefore income at end of three years = £83 16s. $11\frac{7}{25}d$. + £2515 8s. $2\frac{2}{5}d$.
 + £100 = £3599 5s. $1\frac{17}{25}d$.
 As £90 : £3239 6s. $7\frac{64}{125}d$:: £3 : $\frac{67179939 \times 3}{90 \times 240 \times 125}l$.
 = £107 19s. $6\frac{813}{1250}d$. gain by investment.
 Sum invested = £3599 5s. $1\frac{17}{25}d$. - ($\frac{1}{10}$ of £3599 5s. $1\frac{17}{25}d$)
 = £3239 6s. $7\frac{64}{125}d$.
 \therefore income at end of four years = £107 19s. $6\frac{813}{1250}d$. + £3239 6s. $7\frac{64}{125}d$.
 + £1000 = £4347 6s. $2\frac{203}{1250}d$.
 (13) Value = $39\frac{1}{2} \times 3\frac{7}{12} \times 3\frac{7}{12} \times £\frac{1}{8} = \frac{79}{2} \times \frac{43}{12} \times \frac{43}{12} \times \frac{1}{8} = £\frac{146071}{2304}$
 = £63 7s. $11\frac{35}{48}d$.

EXERCISE LXXVII., p. 151.

(1) $3879 \times 42 = 162918$.

(2) 81459 54306 <hr style="width: 100%;"/> 135765 = sum.	81459 54306 <hr style="width: 100%;"/> 27163 <hr style="width: 100%;"/> 5
---	--

135765 = five times difference.

(3) £ s. d. 59 12 $1\frac{3}{4}$ 20 <hr style="width: 100%;"/> 1192s. 12 <hr style="width: 100%;"/> 14306d. 4 <hr style="width: 100%;"/> 57223 farthings.	tons cwt. qrs. lbs. 25 10 3 19 20 <hr style="width: 100%;"/> 510 cwt. 4 <hr style="width: 100%;"/> 2043 qrs. 28 <hr style="width: 100%;"/> 16363 4086 <hr style="width: 100%;"/> 57223 lbs.
---	--

(4) Gain on every lb. = $2s. 6d. - 2s. 2\frac{1}{4}d. = 3\frac{1}{4}d.$

\therefore gain on 572 lbs. = $572 \times 3\frac{1}{4}d. = £8\ 18s. 9d.$

(5) $(\frac{2}{3} \text{ of } \frac{1}{7} \text{ of } \frac{35}{4} = \frac{5}{8}) + (\frac{1}{4} \text{ of } \frac{2}{5} = \frac{1}{10}) = \frac{5}{8} + \frac{1}{10} = \frac{25+3}{30} = \frac{28}{30} = \frac{14}{15}.$

(6) $4 \overline{) 70 \overline{) 89}} \quad (217$

$$\begin{array}{r} 4 \\ 41 \overline{) 70} \\ \underline{41} \\ 427 \overline{) 2989} \\ \underline{2989} \\ \dots \end{array}$$

(7) $18 \times 3 \text{ ft.} : 11 \text{ ft.} :: £15\ 10s. 6d. : \frac{11 \times 3726}{18 \times 3}d. = 769d. = £3\ 3s. 3d.$

(8) 2 cwt. 1 qr. 21 lbs. @ £66 4s. per cwt.

1 qr.	$\frac{1}{4}$	66	4
		2	
		132	8
14 lbs.	$\frac{1}{2}$	16	11
7 lbs.	$\frac{1}{2}$	8	5 6
		4	2 9
		£161	7s. 3d.

(9) $\begin{array}{r} .412 \\ .083 \\ \hline .495 \end{array}$

$\begin{array}{r} .51 \\ .495 \\ \hline .015 \end{array}$

(10) $.00307326 \div 3.013 = .00102.$

(11) Number of cubic in. in 1 litre = $39.4 \div 1000 = .0394.$

(12) $(.0625 \text{ of } 32d. = 2d.) + (\frac{2}{5} \text{ of } \frac{63}{2} = 7d.) + (.8375 \text{ of } 20s. = 16s. 9d.)$

\therefore sum = $2d. + 7d. + 16s. 9d. = 17s. 6d.$

$$\begin{array}{r} 20 \overline{) 17.5} \\ 7 \overline{) .875} \\ \underline{.125} \end{array}$$

(13) Interest = $\frac{£612\frac{1}{2} \times 6 \times 3\frac{1}{2}}{100} = \frac{1225 \times 6 \times 7}{2 \times 100 \times 2}l. = £\frac{1029}{8} = £128\ 12s. 6d.$

(14) $102 \times 31 = 3162.$

(15) $\frac{3}{25} \text{ of } £3\ 19s. 9d. = \frac{3}{25} \times \frac{319}{4} = \frac{957}{4}s.$

$\frac{2}{5} \text{ of } £1\ 2s. = \frac{2}{5} \times \frac{22}{1} = \frac{44}{5}s.$

Fraction = $\frac{44}{5} \div \frac{957}{4} = \frac{44}{5} \times \frac{4}{957} = \frac{16}{33} = 1\frac{1}{15}.$

$$(14) \text{ Discount} = \frac{£33\frac{1}{2} \times 2 \times 7}{100} = \frac{475 \times 2 \times 7}{2 \times 100} = £13\frac{1}{4} = £33 \text{ 5s.}$$

- (17) He travels 40 miles per hour by express, which distance takes $1\frac{1}{2}$ hour by ordinary train.

Travelling by express costs 10d. more than travelling by ordinary train: but $\frac{1}{3}$ of an hour is saved.

\therefore if it cost the same to travel by the one as by the other $\frac{1}{3}$ of an hour would be equal to 10d. and 1 hour to 2s. 6d.

$$\left. \begin{array}{l} £92 : £153 \text{ 14s. 4d.} :: £3\frac{1}{2} : 1403\frac{1}{2}\text{d.} \\ £35 : £184 \text{ 12s. 6}\frac{1}{2}\text{d.} :: £2\frac{1}{2} : 1303\frac{1}{2}\text{d.} \\ £90 : £333 \text{ 6s. 10}\frac{1}{2}\text{d.} :: £3 : 2706\frac{1}{2}\text{d.} \end{array} \right\} \text{sum} = 2706\frac{1}{2}\text{d.}$$

EXERCISE LXXIX, p. 156.

- (1) i. $£3\frac{1}{2} = £3 \cdot 125 = £3 \text{ 1 fl. 3 c. 5 m.}$
 ii. $£4 \text{ 5s. } 2\frac{1}{2}\text{d.} = £4 \cdot 26\frac{1}{4} = £4 \text{ 2 fl. } 6\frac{1}{4}\text{ c.}$
 iii. $£3 \text{ 19s. } 11\frac{1}{2}\text{d.} = £3 \cdot 998\frac{1}{2} = £3 \text{ 9 fl. 9 c. } 8\frac{1}{2}\text{ m.}$
 iv. $£5 \text{ 0s. } 2\frac{1}{2}\text{d.} = £5 \cdot 01\frac{1}{4} = £5 \text{ 0 fl. } 1\frac{1}{4}\text{ c.}$
- (2) i. $£3 \text{ 9 fl. 8 c. 7 m.} = £3 \cdot 987 = £3 \text{ 19s. } 8\frac{2}{3}\text{d.}$
 ii. $£5 \text{ 2 fl. 3 c. 5 m.} = £5 \cdot 235 = £5 \text{ 4s. } 8\frac{2}{5}\text{d.}$
 iii. $£10 \text{ 7 fl. } 4\frac{1}{2}\text{ c.} = £10 \cdot 745 = £10 \text{ 14s. } 10\frac{1}{2}\text{d.}$
 iv. $£5 \text{ 2}\frac{1}{2}\text{ fl.} = £5 \cdot 275 = £5 \text{ 5s. 6d.}$

EXERCISE LXXX, p. 159.

- (1) 1 Hamburg foot = 126·9667 Paris lines
 90 Paris lines = 8 English inches
 12 inches = 1 foot
 x English ft. = 15 Hamburg ft.
 $\therefore x = \frac{126 \cdot 9667 \times 8 \times 15}{90 \times 12} = \frac{126 \cdot 9667}{9} = 14 \cdot 1075 \text{ ft.}$
- (2) 1 verst = 500 sashines
 1 sashine = 3 arshines
 1 arshine = 28 inches
 $1760 \times 3 \times 28 \text{ inches} = 1 \text{ mile}$
 $x \text{ miles} = 1 \text{ verst}$
 $\therefore x = \frac{500 \times 3 \times 28}{1760 \times 3 \times 12} = \frac{175}{264}$

\therefore the ratio of an English mile to a Russian verst is as 264 : 175.

(3)

5 horses = 12 oxen
 6 oxen = 10 sheep
 8 sheep = 20 lambs
 4 lambs = 6 turkeys
 9 turkeys = 12 geese
 3 geese = 12 fowls
 x fowls = 1 horse

$$\therefore x = \frac{12 \times 10 \times 20 \times 6 \times 12 \times 12}{5 \times 6 \times 8 \times 4 \times 9 \times 3} = 80 \text{ fowls}$$

$$\therefore \text{value of a horse} = 80 \times 3s. 6d. = £14.$$

(4)

2 lbs. of pepper = 3 lbs. of flour
 6 „ flour = 4 „ currants
 2 „ currants = 3 „ raisins
 6 „ raisins = 7 „ figs
 7 „ figs = 5 „ Australian meat
 x lbs. of Australian meat = 1 lb. of pepper

$$\therefore x = \frac{3 \times 4 \times 3 \times 7 \times 5}{2 \times 6 \times 2 \times 6 \times 7} = \frac{5}{4} \text{ lb.}$$

$$\therefore \frac{5}{4} \text{ lb.} = 8d. \text{ and } 1 \text{ lb.} = \frac{32}{5}d. = 6\frac{4}{5} \text{ pence.}$$

(5)

£1 = 25 francs
 36 francs = 1 hectolitre
 1 hectolitre = 22 gals.
 8 gals. = 1 bushel
 8 bushels = 1 qr.
 x qrs. = £1

$$\therefore x = \frac{25 \times 22}{36 \times 8 \times 8} = \frac{275}{1152} \text{ qrs.}$$

$$\text{Then } \frac{275}{1152} \text{ qr.} = £1 \therefore 1 \text{ qr.} = £\frac{1152}{275} = £4 \text{ } 3s. \text{ } 9\frac{3}{5}d.$$

(6)

37 fine silver = 40 standard silver
 1 standard silver = $\frac{491}{8}$ pence
 240 pence = £1
 £105 = 1 ton
 1 ton = 2240 lbs.
 1 lb. = 7000 grains
 480 grains = 1 ounce
 1 oz. copper = x fine silver

$$\therefore x = \frac{37 \times 240 \times 105 \times 480 \times 8}{40 \times 491 \times 7000 \times 2240} = \frac{85925}{999} = 86.011 \text{ \&c.}$$

$$\therefore \text{value of fine silver is to copper as } 86.011 : 1.$$

(7)

31 grains = 100 c. in. of air

53 c. in. of air = 48 c. in. of oxygen

1728 c. in. = 1 c. foot

3 c. ft. of oxygen = 14 c. ft. of air

1 c. ft. of air = x grains of oxygen

$$\therefore x = \frac{3 \times 1728 \times 53 \times 31}{100 \times 48 \times 14} = \frac{44361}{350} = 126.745.$$

(8)

£1 = 25 francs

3 francs = 22 gallons

8 gallons = 1 bushel

1 bushel = 84 lbs.

2240 lbs. = 1 ton

1 ton = x £

$$\therefore x = \frac{3 \times 8 \times 2240}{25 \times 22 \times 84} \text{ £} = \frac{564}{55} \text{ £} = \text{£}1 \text{ 3s. } 3\frac{3}{11}\text{d.}$$

(9)

£1 = 12 fl. 15 m.

35 fl. 50 m. = 40 marks

 x marks = £1

$$\therefore x = \frac{1215 \times 40}{3550} = \frac{972}{71} \text{ marks} = 13\frac{42}{71} \text{ marks.}$$

(10)

£10 = 120 fl. 46 kr.

104 fl. 50 kr. = 60 thalers

 x thalers = £1

$$\therefore x = \frac{7246 \times 60}{10 \times 6290} = \frac{21738}{3145} = 6.91 \text{ thalers.}$$

(11) Freight 1s. per cwt., commission and insurance = $3\frac{1}{2}$ per c.
 $\frac{7}{200}$ of £4 10s.

$$\therefore \text{£}4 \text{ 10s.} + \left(\frac{7}{200} \text{ of } \text{£}4\frac{1}{2}\right) + 1\text{s.} = \frac{1883}{20} \text{ shillings, price of 112 l}$$

11.95 fl. = 20s.

 $\frac{1883}{20}\text{s.} = 112 \text{ lbs.}$

1 lb. = 7000 grains

15432 grs. = 1 pound

1 pound = x fl.

$$\therefore x = \frac{11.95 \times 1883 \times 15432}{20 \times 20 \times 112 \times 7000} = \frac{1240173.39}{1120000} = 1 \text{ fl. } 10.7 \text{ c.}$$

(12) $\begin{aligned} &\text{£1} = 25\cdot55 \text{ francs} \\ &120 \text{ francs} = 57 \text{ fl. } 2 \text{ c.} \\ &x \text{ fl.} = \text{£1} \end{aligned}$

$\therefore x = \frac{25\cdot55 \times 57\cdot2}{120} \text{ fl.} = \frac{73\cdot073}{6} \text{ fl.} = 12\cdot18 \text{ fl. nearly, exchange through Paris.}$

$\begin{aligned} &\text{£1} = 13 \text{ mks. } 10 \text{ sch.} \\ &40 \text{ mks.} = 35 \text{ fl. } 1 \text{ c.} \\ &x \text{ fl.} = \text{£1} \end{aligned}$

$\therefore x = \frac{218 \times 35\cdot1}{40 \times 16} \text{ fl.} = \frac{3825\cdot9}{320} \text{ fl.} = 11\cdot95 \text{ fl., \&c., exchange through Hamburg.}$

Profit by a remittance through Paris = $12\cdot18 \text{ fl.} - 11\cdot95 \text{ fl.} = \cdot23 \text{ fl.}$

As $11\cdot95 \text{ fl.} : \cdot23 \text{ fl.} :: 100 : \frac{\cdot23 \times 100}{11\cdot95} = \frac{4\cdot6}{2\cdot39} = \text{£1 } 18s.6d. \text{ nearly,}$
profit per cent.

EXERCISE LXXXI., p. 166.

(25) 2) 16, 42

$\begin{array}{r} 8, 21 \end{array} \therefore \text{L.C.M.} = 336d.$
 $\therefore 336d. \div 42d. = 8 \text{ lbs.}$

(26) £1 1s., 10s. 6d., £1, 2s. 6d., 5s., 1s. = 42, 21, 40, 5, 10, & 2 sixpences respectively.

2) 42, 21, 40, 5, 10, 2

$\begin{array}{r} 21, \quad 20 \end{array} \therefore \text{L.C.M.} = 2 \times 21 \times 20 = 840 \text{ sixpences, or £21.}$

(27) A travels once round in 30 days.

B " " " 24 "
C " " " 20 "

20) 30, 24, 20

$\begin{array}{r} 3, 6, 1 \end{array} \therefore \text{L.C.M.} = 20 \times 6 = 120 \text{ days.}$
 $\therefore \text{they will be together in 120 days.}$
A will have travelled $20 \times 120 = 2400 \text{ miles.}$
B " " $25 \times 120 = 3000 \text{ "}$
C " " $30 \times 120 = 3600 \text{ "}$

(28) $20 \overline{) 100, 120}$

5, 6 \therefore L.C.M. = $20 \times 5 \times 6 = 600$ contacts, or 5 revolutions of large to 6 of small.

(29) $10 \overline{) 50, 20}$

5, 2 \therefore L.C.M. = $10 \times 5 \times 2 = 100$ yds.

\therefore every second house will have a tree in front.

And number of houses with a tree in front = $1600 \div 100 = 16$.

EXERCISE LXXXII., p. 167.

(1) Principal = £387 7s. 7½d. - £41 10s. 1½d. = £345 17s. 6d. = £ $\frac{2767}{8}$.

Interest = £41 10s. 1½d. = $\frac{49806}{240 \times 5}$ l.

$\frac{2767 \times 3 \times R}{8 \times 100} = \frac{49806}{240 \times 5} \therefore R = \frac{49806}{240 \times 5} \times \frac{800}{2767 \times 3} = 4$ per cent.

(2)

ft.	in.	pts.
7	9	10
6	11	11

46	11	0		
7	2	0	2	
	7	2	0	2
54	8	2	2	2
5	4			

273	4	10	10	10
18	2	8	8	8

291 7 7' 7" 6''' 8''' = 291 c. ft. 1099½ c. in.

12

91

12

1099½ c. in.

$\frac{6}{12} + \frac{8}{144} = \frac{80}{144} = \frac{5}{9}$.

(3) $\sqrt[3]{47558 \frac{2185}{2197}} = \sqrt[3]{\frac{10448711}{2197}} = \frac{471}{13} = 36 \frac{3}{13}$.

	104|487|111 (471
	64
$4^2 \times 300 = 4800$	40487
$4 \times 7 \times 30 = 840$	
$7^2 = 49$	
5689	39823
$47^2 \times 300 = 662700$	664111
$47 \times 1 \times 30 = 1410$	
$1^2 = 1$	
664111	664111

	2|197 (13
	1
$1^2 \times 300 = 300$	1197
$1 \times 3 \times 30 = 90$	
$3^2 = 9$	
399	1197

4) £100 stk. : £8000 stk. :: £3 : $\frac{8000 \times 3}{100}l. = £240$ 1st income.

£100 stk. : £8000 stk. :: £87½ : $\frac{8000 \times 175}{100 \times 2}l. = £7000$ sterling.

£91 : £7000 :: £3¼ : $\frac{7000 \times 13}{91 \times 4} = £250$ 2nd income.

∴ increase in income = £250 - £240 = £10.

5) Average loss per day = $\frac{(10'' + 7'') - \frac{60''}{7}}{3} = \frac{59''}{7} + 3.$

∴ loss in 270 days = $\frac{59}{7} \times \frac{1}{8} \times \frac{270}{1} = 12\frac{9}{14}$ minutes.

(6) $\left. \begin{array}{l} 60 \text{ pioneers : } 24 \text{ pioneers} \\ 63 \text{ days : } 10 \text{ days} \\ 628\frac{7}{8} \times 9 \times 5 \text{ yds. : } 9280\frac{1}{8} \times 4\frac{7}{8} \times 1\frac{3}{8} \text{ yds.} \end{array} \right\} :: 6\frac{1}{4} \text{ hrs.}$

Then $\frac{24 \times 10 \times 78561 \times 39 \times 8 \times 8 \times 25}{60 \times 63 \times 5031 \times 9 \times 5 \times 5 \times 8 \times 8 \times 4} = \frac{22}{27} = 1\frac{2}{27}$ hours.

$$(7) 1.428571 \times 1.63 = \frac{1428571}{999990} \times \frac{163}{100} = \frac{1428571}{999990} \times \frac{16}{11} = \frac{1428571}{211105} = 2.1376 \text{ \&c.}$$

$$1.428571 \div 1.63 = \frac{1428571}{999990} \times \frac{11}{16} = \frac{15714127}{17999820} = .87301 \text{ \&c.}$$

$$\therefore \text{ difference} = 2.1376 - .87301 = 1.46459.$$

$$(8) \text{£}100 \text{ stk. : £}2000 \text{ stk.} :: \text{£}87\frac{1}{2} : \frac{2000 \times 175}{100 \times 2} = \text{£}1750.$$

$$\text{£}100 \text{ stk. : £}4000 \text{ stk.} :: \text{£}95 : \frac{4000 \times 95}{100} = \text{£}3800.$$

$$\text{£}100 \text{ stk. : £}5000 \text{ stk.} :: \text{£}85 : \frac{5000 \times 85}{100} = \text{£}4250.$$

$$\text{Stock} = \text{£}2000 + \text{£}4000 + \text{£}5000 = \text{£}11000.$$

$$\text{Sterling} = \text{£}1750 + \text{£}3800 + \text{£}4250 = \text{£}9800.$$

$$\therefore \text{ average price paid} = \frac{9800 \times 100}{11000} = \frac{980}{11} = 89\frac{1}{11}.$$

$$\text{And average rate} = \frac{100 \times 3}{89\frac{1}{11}} = 3\frac{18}{49}.$$

$$(9) \text{ No. of yds. required} = (29.5 \times 17.19 \div 2.4)\frac{1}{8} = \frac{266}{8} \times \frac{86}{8} \times \frac{9}{22} \times \frac{1}{3} = \frac{11455}{185}$$

$$= 69\frac{53}{185}.$$

$$(10) \frac{\frac{41}{9} + \frac{61}{9}}{\frac{11}{33} + \frac{35}{66}} + \frac{7\frac{5}{11} \times \frac{3\frac{3}{4}}{5}}{\frac{5}{9} - \frac{3}{7}} + \frac{6\frac{48}{55}}{\frac{68}{66}} = \frac{3}{8} + \frac{\frac{252}{11}}{\frac{8}{63}} + \frac{379}{55} = (\frac{3}{8} \times \frac{63}{68}) + (\frac{252}{11} \times \frac{63}{8} \times \frac{55}{378})$$

$$= \frac{23}{34} + \frac{105}{4} = \frac{1831}{68} = 26\frac{63}{68}.$$

$$(11) \text{ Average price of each horse} = \{(8 \times \text{£}24) + (7 \times \text{£}32\frac{1}{2}) + (5 \times \text{£}47\frac{1}{2}) + (3 \times \text{£}50)\} \div 23 = (\text{£}192 + \text{£}227\frac{1}{2} + \text{£}236\frac{1}{4} + \text{£}150) \div 23 = \text{£}805\frac{1}{4} \div 23 = \text{£}35 \text{ Os. } 7\frac{19}{23}d.$$

$$(12) \text{ Between 9 a.m. and 11 p.m. 16 persons pass per minute, or 13440 pass during the whole time.}$$

$$\text{Between 11 p.m. and 9 a.m. 5 persons pass per minute, or 3000 during the whole time.}$$

$$\therefore \text{ No. of persons who pass daily} = 13440 + 3000 = 16440.$$

$$\text{And No. who pass in 1 year} = 16440 \times 365 = 6000600.$$

$$(13) \text{ £}5\frac{1}{4} : \text{£}100 :: \text{£}126 \text{ } 13s. \text{ } 1\frac{1}{2}d. : \frac{100 \times 60795 \times 4}{480 \times 21} = \frac{14475}{8}$$

= £2412 10s. sum invested.

$$\text{£}75 : \text{£}3 :: \text{£}2412\frac{1}{2} : \frac{3 \times \text{£}2412\frac{1}{2}}{75} = 96\frac{1}{2} \text{ price of 3 per Cents.}$$

$$(14) \text{ Specific gravity of gold} = 19.35 = 19\frac{7}{20} = \frac{387}{20}.$$

$$\text{Specific gravity of silver} = 10.15 = 10\frac{3}{20} = \frac{203}{20}.$$

$$\left. \begin{array}{l} 4.18 = 4\frac{9}{50} = \frac{209}{50} \text{ inches long} \\ .64 = \frac{64}{100} = \frac{16}{25} \text{ inches broad} \\ .31 = \frac{31}{100} \text{ inches deep} \end{array} \right\} \text{ Gold.}$$

$$\left. \begin{array}{l} 13.02 = 13\frac{1}{50} = \frac{651}{50} \text{ inches long} \\ 1.14 = 1\frac{14}{100} = \frac{57}{50} \text{ inches broad} \\ .65 = \frac{65}{100} = \frac{13}{20} \text{ inches deep} \end{array} \right\} \text{ Silver.}$$

$$\therefore \text{ratio} = \left(\frac{387}{20} \times \frac{209}{50} \times \frac{16}{25} \times \frac{31}{100} \right) \div \left(\frac{203}{20} \times \frac{651}{50} \times \frac{57}{50} \times \frac{13}{20} \right) = \frac{387}{20} \times \frac{209}{50} \times \frac{16}{25} \times \frac{31}{100} \times \frac{20}{203} \times \frac{50}{651} \times \frac{50}{57} \times \frac{20}{13} = \frac{15136}{92365} = 15136 : 92365.$$

$$(15) \text{ Cost of entire work} = \frac{75000 \times 100}{115} \text{ } l. = \frac{\text{£}7500000}{115} = \text{£}65217 \text{ } 7s. \text{ } 9\frac{2}{3}d.$$

$\therefore \text{£}75000 - \text{£}65217 \text{ } 7s. \text{ } 9\frac{2}{3}d. = \text{£}9782 \text{ } 12s. \text{ } 2\frac{2}{3}d. = \text{gain which will not be affected by the rise and fall of labour and materials as they rise and fall in the same ratio.}$

$$(16) 4\frac{3}{8} : 4 :: 100 : \frac{4 \times 100 \times 8}{35} = \frac{320}{7} = 91\frac{3}{7}.$$

$$(17) \text{ Edge} = \sqrt{42.875} = 3.5 \text{ feet.}$$

$$\therefore \text{cost of painting} = \{(3\frac{1}{2})^2 \times 6 \times 1\frac{1}{4}s.\} \div 9 = \frac{7}{2} \times \frac{7}{2} \times \frac{6}{1} \times \frac{5}{4} \times \frac{1}{8} = \frac{245}{32}s. = 10s. \text{ } 2\frac{1}{2}d.$$

$$(18) \text{ Loss on 360 shares} = (2\frac{13}{16} - 2\frac{3}{8}) \times 360 = 157 \text{ } 10 \text{ } 0$$

$$\text{Brokerage} = (2\frac{13}{16} + 2\frac{3}{8}) \times 360 \times \frac{1}{500} = 9 \text{ } 6 \text{ } 9$$

$$\therefore \text{his total loss} = \text{£}166 \text{ } 16s. \text{ } 9d.$$

$$(19) \left. \begin{array}{l} 48 \text{ miles} : 36 \text{ miles} \\ 2 : 1 \end{array} \right\} :: 3\frac{1}{2} \text{ hrs.}$$

$$\text{Then } \frac{36 \times 7}{48 \times 2 \times 2} = \frac{21}{16} \text{ hrs.} = 1\frac{5}{16} \text{ hrs.} = 1 \text{ hr. } 18' \text{ } 45''.$$

$$(20) \text{ Increase} = \frac{24000 \times 6}{28000} = 5\frac{1}{7} \text{ per cent.}$$

$$(21) \text{ Total number of passengers} = 4174213 + 10291749 + 21409217 \\ + 2124917 + 6172429 + 15473551 + 307429 + 1292476 + 2374237 \\ = 63620218.$$

$$\text{No. of 3rd class passengers} = 21409217 + 15473551 + 2374237 \\ = 39257005.$$

$$\therefore \text{proportion per cent. of 3rd class passengers to whole number} \\ \text{of passengers} = \frac{100 \times 39257005}{63620218} = 61.7 \text{ \&c.}$$

$$(22) 4 \text{ per cent.} = \frac{1}{25} \text{ of your income} \therefore 1 - \frac{1}{25} \text{ or } \frac{24}{25} \text{ is left.}$$

$$\frac{24}{25} : 1 :: £1250 : \frac{1250 \times 25}{24} \text{ l.} = £\frac{15625}{12} = £1302 \text{ 1s. } 8d.$$

$$(23) \text{ Average} = 13.5 + 21 + .4 + 71.75 + .0023 + 3.125 + 0 + 67.35 \\ = 178.0773 + 9 = 19.78636.$$

$$(24) 365d. : £76 \text{ 3s. } 10\frac{1}{2}d. :: £100 : \frac{36573 \times 100}{365 \times 2} \text{ l.} = £5010.$$

$$(25) £100 : £61000 :: £3 : \frac{61000 \times 3}{100} \text{ l.} = £1830 \text{ 1st income.}$$

$$£100 : £61000 :: £75\frac{1}{4} : \frac{61000 \times 301}{100 \times 4} \text{ l.} = £\frac{183610}{4} \text{ sterling.}$$

$$£114\frac{3}{8} : £\frac{183610}{4} :: £5 : \frac{183610 \times 5 \times 8}{915 \times 4} \text{ l.} = £\frac{6020}{3} = £2006 \text{ 13s. } 4$$

2nd income.

$$\text{Increase in income} = £2006 \text{ 13s. } 4d. - £1830 = £176 \text{ 13s. } 4d.$$

$$(26) \text{ As } 7s. \text{ } 1\frac{1}{2}d. : £1756 :: 12s. \text{ } 10\frac{1}{2}d. : £1756 : \frac{1756 \times 309}{171} \text{ l.}$$

$$= £\frac{180868}{57} = £3173 \text{ 2s. } 5\frac{9}{15}d.$$

$$(27) \frac{3\frac{2}{3}, 3\frac{9}{32}, 3\frac{39}{50}, 3\frac{121}{250}, 3\frac{123}{500}}{72000} = \frac{48000, 20250, 56160, 34848, 15440}{72000}$$

$$\therefore \text{order of magnitude} = \frac{339}{50}, 3\frac{2}{3}, \frac{3121}{250}, 3\frac{9}{32}, \frac{3123}{500}.$$

$$8) \left(\frac{1}{2} \text{ of } \frac{5}{4} \text{ of } \frac{7}{8} \times \frac{8}{1} = \frac{385}{12} \text{ fur.}\right) : \left(\frac{1}{20} \text{ of } \frac{11}{2} = \frac{11}{40} \text{ fur.}\right) = \frac{385}{12} : \frac{11}{40} \\ = 350 : 3.$$

$$9) £203 - £118 = £85 \times 5 = £425 = 9\text{ } 5s. = 9s. 6d.$$

10) $6\sqrt[3]{3} \times 5\sqrt[3]{3} \times 4\sqrt[3]{3}$ = solid contents of the required cistern. Therefore the sides are $6\sqrt[3]{3}$, $5\sqrt[3]{3}$, and $4\sqrt[3]{3}$ feet respectively.
 $\sqrt[3]{3} = 1.442 \text{ \&c.}$

$$\left. \begin{array}{l} 6 \times 1.442 = 8.653 \text{ \&c.} \\ 5 \times 1.442 = 7.211 \text{ \&c.} \\ 4 \times 1.442 = 5.769 \text{ \&c.} \end{array} \right\} \text{ sides of the cistern.}$$

ft.	in.			
2	10	11'		
3	7	5		
<hr style="width: 100%;"/>				
8	8	9		
1	8	4	5	
	1	2	6	7
<hr style="width: 100%;"/>				
10	6	3'	11"	7''' = 10 sq. ft. $75\frac{139}{144}$ sq. in.
	12			
		$75\frac{139}{144}$ in.	$\frac{11}{12} + \frac{7}{144} = \frac{139}{144}$ in.	

11) As $£95\frac{3}{8} : £4700 :: £3 : \frac{4700 \times 3 \times 8}{763} \text{ l.} = \frac{£112800}{763} = £147 \text{ } 16s. 8\frac{769}{763}d.$
income.

As $£95\frac{3}{8} : £100 :: £3 : \frac{100 \times 3 \times 8}{763} \text{ l.} = \frac{£2400}{763} = 3\frac{111}{763}$ rate of interest.

12) Interest to be paid = $\frac{2300000 \times 17}{100 \times 4} \text{ l.} = £97750.$

Net receipts = $\frac{635000 \times 55}{100} \text{ l.} = £349250.$

Interest and reserve fund = $£97750 + £11000 = £108750.$

\therefore sum due to shareholders = $£349250 - £108750 = £240500.$

As $£3700000 : £100 :: £240500 : \frac{100 \times 240500}{3700000} = \frac{13}{2} = 6\frac{1}{2} \text{ p.c.}$

$$(34) \left. \begin{array}{l} 32\frac{1}{8} \text{ cwt.} : 90 \text{ cwt.} \\ 64 \text{ miles} : 24 \text{ miles} \end{array} \right\} :: £\frac{5}{8}.$$

$$\text{Then } \frac{90 \times 24 \times 5 \times 56}{189 \times 64 \times 8} l. = £\frac{25}{4} = £6 \text{ } 5s.$$

$$(35) \begin{array}{lll} \text{No. of 1st class passengers} & = \frac{4}{27} \text{ of } \frac{270}{1} = 40. \\ \text{,, 2nd ,, ,,} & = \frac{7}{27} \text{ of } \frac{270}{1} = 70. \\ \text{,, 3rd ,, ,,} & = \frac{16}{27} \text{ of } \frac{270}{1} = 160. \end{array}$$

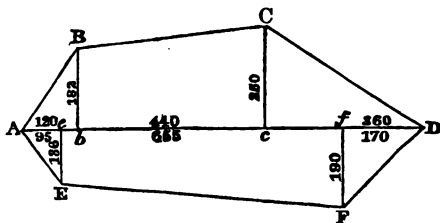
$$\begin{aligned} \text{Total payment of 1st class passengers} &= \frac{40 \times 40 \times 2}{240} l. = £\frac{40}{3} \\ &= £13 \text{ } 6s. \text{ } 8d. \end{aligned}$$

$$\begin{aligned} \text{Total payment of 2nd class passengers} &= \frac{70 \times 3 \times 35}{240 \times 2} l. = £\frac{245}{16} \\ &= £15 \text{ } 6s. \text{ } 3d. \end{aligned}$$

$$\begin{aligned} \text{Total payment of 3rd class passengers} &= \frac{160 \times 25}{240} l. = £\frac{50}{3} \\ &= £16 \text{ } 13s. \text{ } 4d. \end{aligned}$$

$$\begin{aligned} \therefore \text{total earning of the train} &= £13 \text{ } 6s. \text{ } 8d. + £15 \text{ } 6s. \text{ } 3d. \\ &+ £16 \text{ } 13s. \text{ } 4d. = £45 \text{ } 6s. \text{ } 3d. \end{aligned}$$

(36)



$$ABb = \frac{120 \times 182}{2} = 10920 \text{ links}; \quad DCC = \frac{360 \times 250}{2} = 45000 \text{ links} :$$

$$AEe = \frac{95 \times 136}{2} = 6460 \text{ links} ; \quad DFF = \frac{190 \times 170}{2} = 16150 \text{ links} :$$

$$BCbc = \frac{(250 + 182) \times 440}{2} = 95040 \text{ links} :$$

$$EFef = \frac{(136 + 190) \times 655}{2} = 106765 \text{ links.}$$

$$\begin{aligned} \text{Total area of the field} &= 10920 + 45000 + 6460 + 16150 + 95040 \\ &+ 106765 = 280335 \text{ links} = 2.80335 \text{ acres} = 2\text{A. } 3\text{R. } 8 \text{ pls. } \\ &\underline{16.214 \text{ yds.}} \end{aligned}$$

- 7) Let x represent 1st year's income; then $x + \frac{1}{3}x + \frac{1}{5}x + \frac{6}{27}x = \frac{175}{27}x$
 $= 4$ years' income; but he saves $\frac{2}{3}$ of all his income $\therefore \frac{2}{3}$ of $\frac{175}{27}x$
 or $\frac{350}{81}x = \frac{7000}{27}$ clearing of fractions.

$$350x = 21000 \therefore x \text{ or 1st year's income} = \frac{21000}{350} = £60.$$

- 8) Total No. of words $= (14 \times 130) + (57 \times 14) + (36 \times 29) = 1820 + 798 + 1044 = 3662.$

$$\therefore \text{receipts} = \frac{3662 \times 45}{20}d. = \frac{164790}{20}d. = £34 \text{ 6s. } 7\frac{1}{2}d.$$

-) No. of links $= 320013504$ links.

	320|013|504 (684 links = side.
	216
$6^2 \times 300 = 10800$	104013
$6 \times 30 \times 8 = 1440$	
$8^2 = 64$	
12304	98432
$68^2 \times 300 = 1387200$	5581504
$68 \times 30 \times 4 = 8160$	
$4^2 = 16$	
1395376	5581504

-) Gain on £100 stock $= 93\frac{1}{2} - 90 = 3\frac{1}{2}.$

$$£100 \text{ stk.} : £1000 \text{ stk.} :: £3\frac{1}{2} : \frac{1000 \times 3\frac{1}{2}}{100}l. = £35 \text{ gain.}$$

$$\therefore \text{loss} = £35 - £6\frac{1}{4} = £28\frac{3}{4}; \text{ and loss on } £100 \text{ stock} = 90 - 84\frac{1}{4} = 5\frac{3}{4}.$$

$$£5\frac{1}{4} : £28\frac{3}{4} :: £100 \text{ stock} : \frac{28\frac{3}{4} \times 100}{5\frac{3}{4}}l. = £500 \text{ sold at a loss.}$$

$$£100 \text{ stk.} : (£1000 + £500) \text{ stk.} :: £90 : \frac{1500 \times 90}{100}l. = £1350 \text{ sum required}$$

$$£100 \text{ stk.} : (£1000 + £500) \text{ stk.} :: £3 : \frac{1500 \times 3}{100}l. = £45 \text{ 1st income.}$$

$$£100 : (£1350 + £6\frac{1}{4}) :: £4 : \frac{5425 \times 4}{100 \times 4}l. = £54 \text{ 5s. 2nd income.}$$

$$\therefore \text{difference in income} = £54 \text{ 5s.} - £45 = £9 \text{ 5s.}$$

- (41) Let 2 represent
- A
- 's capital.

" 4 " B 's "

" 3 " C 's "

" 9 " D 's "

$$2 + 4 + 3 + 9 = 18.$$

\therefore share of $A = \frac{2}{18}$ of £5000 = £555 11s. $1\frac{1}{3}d.$

" $B = \frac{4}{18}$ of £5000 = £1111 2s. $2\frac{2}{3}d.$

" $C = \frac{3}{18}$ of £5000 = £833 6s. 8d.

" $D = \frac{9}{18}$ of £5000 = £2500.

- (42) Yearly expenditure = 6 guineas
- $\times 52 =$
- £327 12s.

$$\therefore \text{income} = \text{£327 12s.} + \text{£300} = \text{£627 12s.}$$

- (43) As 90 is the L.C.M. it is clear the least time in which they will be together at the starting point is 90 minutes.

But they also will be together in $22\frac{1}{2}$ min., as the first will have walked $2\frac{1}{4}$ rounds, the second $1\frac{1}{4}$ rounds, and the third $\frac{1}{4}$ of a round.

- (44) 1 hr. : 10 sec.
- \therefore
- 4 miles :
- $19\frac{5}{9}$
- yds., distance travelled by
- A
- in 10".
-
- \therefore
- the train travels
- $88 + 19\frac{5}{9} = 107\frac{5}{9}$
- yds. in 10", or 22 miles per hour, or
- $96\frac{4}{9}$
- yds. in 9".

Then in 9" B will have travelled $96\frac{4}{9} - 88 = 8\frac{4}{9}$ yds., or 2 miles per hour.

As train travels 22 miles per hour and A 4 per hour,

\therefore in 20' the train will have travelled $\frac{22}{3}$ miles and 1st man $\frac{4}{3}$ mile.

$\therefore \frac{22}{3} - \frac{4}{3} = 6$ miles distance of train from 1st man and 1st man from 2nd.

As A travels twice as fast as B , he will do 12 miles to B 's 6 miles, and will therefore overtake B in 3 hours.

\therefore distance travelled by train = $22 \times 3 = 66$ miles.

But B will have travelled 6 miles in 3 hours.

$\therefore 66 - 6 = 60$ miles distance of train from A and B .

- (45) As 10 mls. : 6 mls.
- \therefore
- 1 hr. : 36' with the wind.

\therefore difference between coming and going = $50' - 36' = 14'$.

As the man is equally retarded and accelerated,

$\therefore 14' \div 2 = 7'$ in 6 miles.

6) Principal = £202 4s. - £2 4s. = £200.

$$\therefore \frac{200 \times \frac{7}{8} \times R}{100 \times \frac{3}{5}} = 2\frac{1}{2} \therefore R = \frac{11}{5} \times \frac{5}{3} = \frac{11}{3} = 5\frac{1}{3} \text{ p.c.}$$

7) A receives $\frac{1}{20}$ of £438 = £21 8s.

B " $\frac{1}{20}$ of £292 = £14 12s.

C " $\frac{1}{20}$ of £730 = £36 10s.

Remaining gain = £200 - £73 = £127.

438 + 292 + 730 = 1460.

\therefore total amount received by A = £21 8s. + $(\frac{438}{1460} \times \frac{127}{1})$ l. = £60.

" " " B = £14 12s. + $(\frac{292}{1460} \times \frac{127}{1})$ l. = £40.

" " " C = £36 10s. + $(\frac{730}{1460} \times \frac{127}{1})$ l. = £100.

8) An income tax of 4d. in the £ = $\frac{4}{240}$ or $\frac{1}{60}$ of your income, $\frac{1}{60}$ of £5 or £ $\frac{1}{12}$ = the income tax on £5; therefore the net income received from £100 stock = £5 - $\frac{1}{12}$ = £4 $\frac{11}{12}$.

$$£6 : £4\frac{11}{12} :: £100 : \frac{59 \times 100}{6 \times 12} = \frac{1475}{18} = 81\frac{17}{18}.$$

9) As £17480 : £100 :: £437 : $\frac{100 \times 437}{17480} = \frac{5}{2} = 2\frac{1}{2}$ p.c.

\therefore rise in rental = $2\frac{1}{2} - 2\frac{1}{2} = \frac{1}{2}$ p.c.

10) As £100 : £10 :: £20 : $\frac{10 \times 20}{100}$ l. = £2 income from one bank share.

\therefore income from 140 bank shares = $140 \times £2 = £280$.

$32\frac{1}{2} \times 140 = £4515$ sum invested in Exchequer bills.

£100 $\frac{1}{2}$: £4515 :: $(2\frac{1}{2} \times 365d.)$: $\frac{549325}{3216} = £170$ 16s. $2\frac{27}{37}d.$ income from Exchequer bills.

\therefore difference in income = £280 - £170 16s. $2\frac{27}{37}d.$ = £109 3s. $9\frac{10}{37}d.$

(51)

$$\begin{array}{r}
 3 \overline{) 78 \cdot 30 \cdot 24 \cdot 90} \quad (19 \cdot 449 \text{ \&c.}) \\
 \underline{1} \\
 29 \overline{) 278} \\
 \underline{261} \\
 384 \overline{) 1730} \\
 \underline{1536} \\
 3884 \overline{) 19424} \\
 \underline{15536} \\
 38889 \overline{) 388890} \\
 \underline{376651} \\
 12239
 \end{array}$$

$$\begin{array}{r}
 42 \cdot 033 \overline{) 610} \quad (3 \cdot 47 \text{ \&c.}) \\
 \underline{27} \\
 3^2 \times 300 = 2700 \quad 15033 \\
 3 \times 30 \times 4 = 360 \\
 4^2 = 16 \\
 \underline{3076} \quad 12304 \\
 34^2 \times 300 = 346800 \quad 2729610 \\
 34 \times 30 \times 7 = 7140 \\
 7^2 = 49 \\
 \underline{353989} \quad 2477643
 \end{array}$$

(52)

$$\begin{aligned}
 £1 &= 25\frac{1}{2} \text{ francs} \\
 117 \text{ francs} &= 55 \text{ florins} \\
 11 \text{ florins} &= 13 \text{ marks} \\
 x \text{ marks} &= £1
 \end{aligned}$$

$$\therefore x = \frac{51 \times 55 \times 13}{2 \times 117 \times 11} = \frac{85}{8} = 14 \cdot 16 \text{ marks for } £1.$$

- (53) Cost price per share = £3 15s. - ($\frac{1}{25}$ of £3 15s.) = £3 12s.
 Selling „ „ = £3 15s. + ($\frac{1}{25}$ of £3 15s.) = £3 15s. 9d.
 \therefore gain per share = £3 15s. 9d. - £3 12s. = 3s. 9d.
 And gain on 77 shares = 3s. 9d. \times 77 = £14 8s. 9d.

- 4) As $4\frac{1}{2}$ mls. : 20 mls. :: 1 hr. : $\frac{20 \times 1 \times 2}{9}$ hrs. = $\frac{40}{9}$ hrs.
 $\therefore \frac{40}{9} + \frac{2}{3} = \frac{46}{9}$ hrs. time taken by A to travel 20 miles.
 Again 1 hr. : $\frac{46}{9}$ hrs. :: $3\frac{1}{2}$ mls. : $\frac{46 \times 7}{9 \times 2}$ mls. = $\frac{161}{9}$ mls. = $17\frac{5}{9}$ miles,
 distance travelled by B in same time.
 \therefore distance travelled by A and B = $20 + 17\frac{5}{9} = 37\frac{5}{9}$ miles.
 And $50 - 37\frac{5}{9} = 12\frac{1}{9}$ miles still to be travelled.
 Without stopping A and B travel in the ratio of 9 : 7. \therefore A will
 travel $\frac{9}{16}$ of $12\frac{1}{9} = 6\frac{13}{18}$ miles more before met by B.
 \therefore they will meet $20 + 6\frac{13}{18}$ or $26\frac{13}{18}$ miles from London.
- 5) No. of lines = $41.06328 \div .0438 = 937$ lines, with .51792 of a line
 over.
 \therefore length of remaining line = $.51792 \times .0438$ in. = .022684896 in.
- 6) Average decrease = $(£369 \text{ 18s. } 10d. - £360 \text{ 1s. } 1d.) + 21 = 9s. \text{ 5d.}$
 \therefore average income = $£374 \text{ 9s. } 8d. - 9s. \text{ 5d.} = £374 \text{ 0s. } 3d.$
- 7) Let b represent the breadth.
 Then $3b$ „ „ length.
 $\therefore 3b^2 = 6A. \text{ 900 yds. or } 29940 \text{ yards.}$
 $b^2 = 9980 \text{ yds.}$
 $\therefore b = \sqrt{9980} = 99.899 \text{ \&c. yds. and } 3b = 99.899 \text{ yds.} \times 3$
 $= 299.697 \text{ yds.}$
- 8) Creditors lose in every pound = $£1 - 6s. \text{ 10}\frac{1}{2}d. = 13s. \text{ 1}\frac{1}{2}d.$
 \therefore lose per cent. = $13s. \text{ 1}\frac{1}{2}d. \times 100 = £65 \text{ 12s. } 6d.$
- 9) As $1 : 1\frac{3}{20} :: 15 : \frac{15 \times 23}{20} = \frac{69}{4} = 17\frac{1}{4}$ gain per cent. in selling.
 \therefore whole gain per cent. = $15 + 17\frac{1}{4} = 32\frac{1}{4}$ p.c.
- 10) i. $1\frac{1}{2}$ yr. and 10 per cent. = twice No. of yrs. and $\frac{1}{2}$ the p.c.
 3 yrs.; and 5 per cent.
 $5 \text{ p.c.} = \frac{1}{20} \therefore M = (1\frac{1}{20})^3 \times £2400.$
 $\therefore M = \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{2400}{1} = £2778\frac{3}{10} = £2778 \text{ 6s.}$

ii. Interest = £2778 6s. - £2400 = £378 6s. = £ $\frac{3783}{10}$.

12

$$\frac{2400 \times 3 \times R}{100 \times 2} = \frac{3783}{10} \therefore R = \frac{3783}{10} \times \frac{1}{36} = \frac{1261}{120} = 10\frac{61}{120} \text{ per cent.}$$

(61) Estimated cost = £6000 × 35 = £210000.

Real cost = £210000 + £60000 = £270000.

Price of shares = £50 + £4 = £54.

$$270000 : £210000 :: £54 : \frac{21 \times 54}{27} = £42.$$

(62) As £5 : £3 $\frac{1}{4}$:: 100 : $\frac{13 \times 100}{4 \times 5} = £65$ cost price.

First income = £3 $\frac{1}{4}$ × 20 = £65.

Selling price = £65 + £7 = £72.

Money realised by sale of shares = £72 × £20 = £1440.

$$£90 : £1440 :: £3\frac{1}{4} : \frac{1440 \times 7}{90 \times 4} = £52 \text{ second income.}$$

\therefore loss in income = £65 - £52 = £13.

(63) As often as *A* takes 12, *B* takes 9 and *C* 14.

12 + 9 + 14 = 35.

No. *A* takes = $\frac{12}{35}$ of $\frac{1155}{1} = 396$.

„ *B* „ = $\frac{9}{35}$ of $\frac{1155}{1} = 297$.

„ *C* „ = $\frac{14}{35}$ of $\frac{1155}{1} = 462$.

(64) As $\frac{4}{3} : 1 :: 36000 : \frac{4 \times 36000}{3} = 48000$ number before retreat

No. before defeat = (48000 - 6000) + 8000 = 50000.

\therefore original number = $\frac{6}{5}$ of $\frac{50000}{1} = 60000$ men.

(65) $4 \cdot 28571\bar{4} \times 4 \cdot 09 = 4\frac{2}{7} \times 4\frac{1}{11} = \frac{30}{7} \times \frac{45}{11} = \frac{1350}{77} = 17\frac{41}{77}$.

$$4\frac{2}{7} + 4\frac{1}{11} = \frac{30}{7} \times \frac{11}{45} = \frac{22}{21} = 1\frac{1}{21}.$$

(66) Time taken by *A* to reach *B* = $\left(\frac{3}{4} + \frac{12}{54}\right)$ hrs. = $\frac{85}{28}$ hours.

As 1 hr. : $\frac{85}{28}$ hrs. :: $3\frac{1}{2}$ mls. : $10\frac{5}{8}$ mls. distance travelled in the same time.

\therefore No. of miles still to be travelled by *B* = $15 - 10\frac{5}{8} = 4\frac{3}{8}$ mil

$$(67) \left. \begin{array}{l} 10 \text{ men} : 12 \text{ men} \\ 1 : 1\frac{1}{2} \\ 3 : 4 \\ 1 \text{ hr.} : 1\frac{1}{2} \text{ hr.} \\ 1\frac{1}{2} : 1 \end{array} \right\} :: 21 \text{ days.}$$

$$\text{Then } \frac{12 \times 7 \times 4 \times 3 \times 21 \times 2}{10 \times 3 \times 3 \times 4 \times 2} \text{ dys.} = \frac{294}{5} \text{ dys.} = 58\frac{2}{5} \text{ days.}$$

$$(68) \text{ Average loss per day} = \frac{(11'' + 8'') - \frac{30''}{7}}{3} = 14\frac{5}{7}'' \div 3.$$

$$\therefore \text{ loss in 150 days} = 14\frac{5}{7}'' \times \frac{1}{3} \times 150 = 12' 15\frac{5}{7}''.$$

$$(69) \text{ Duty per gallon after reduction} = (8s. 4d. - \frac{1}{25} \text{ of } 8s. 4d.) = 8s.$$

$$\text{Loss in duty} = \frac{4500000 \times 4}{240} = £75000.$$

$$\text{Gain on increase in consumption} = 4500000 \times \frac{6}{100} \times £\frac{8}{20} = £108000.$$

$$\therefore \text{ increase to revenue} = £108000 - £75000 = £33000.$$

$$(70) \frac{11\frac{1}{2}}{1} \times \frac{3}{4} = 48 \text{ shillings.}$$

$$\therefore \text{ cost of 1 lb.} = 48 \text{ farthings or 1 shilling.}$$

$$(71) \text{ Area of park} = 2125764 \text{ yards.}$$

$$\begin{array}{r} 2|12|57|64 \text{ (1458 yards.} \\ 1 \\ \hline 24) \ 112 \\ \quad 96 \\ \hline 285) \ 1657 \\ \quad 1425 \\ \hline 2908) \ 23264 \\ \quad 23264 \\ \hline \dots \end{array}$$

$$(72) 56 \text{ gallons} = 448 \text{ pints } \therefore 448 \div 2\frac{1}{2} = 192 \text{ times.}$$

$$(73) \text{ If the hour-hand did not move they would be directly opposite in } 10 \text{ minutes, but the hour-hand at the same time will have moved } \frac{1}{12} \text{th of the space.}$$

$$\therefore 1 - \frac{1}{12} : 1 :: 10 \text{ min.} : 10\frac{10}{11} \text{ min. past 8.}$$

(74) Let x = the No. of girls; then $\frac{52}{99}x$ = No. of boys.

$$\therefore x + \frac{52}{99}x = 453 \text{ or } 1\frac{52}{99}x = 453.$$

$$\therefore x = \frac{453 \times 99}{151} = 297 \text{ number of girls.}$$

$$\therefore \text{number of boys} = 453 - 297 = 156.$$

$$(75) £39\frac{1}{2} : 100 :: 19s. 10\frac{1}{2}d. : \frac{100 \times 477 \times 4}{159 \times 480} = 2\frac{1}{2} \text{ per cent.}$$

$$(76) \text{ i. } 3 \text{ per cent.} = \frac{3}{100} \therefore M = (1\frac{3}{100})^7 \times £83 \text{ } 14s. \text{ } 7d.$$

$$M = \frac{103}{100} \times \frac{103}{100} \times \frac{103}{100} \times \frac{103}{100} \times \frac{103}{100} \times \frac{103}{100} \times \frac{103}{100} \times \frac{20095}{240} \\ = \frac{£424283206514255253}{480000000000000} = £102 \text{ } 19s. \text{ } 7d.$$

$$C.L. = £102 \text{ } 19s. \text{ } 7d. - £83 \text{ } 14s. \text{ } 7d. = £19 \text{ } 5s.$$

$$\text{ii. } S.L. = \frac{20095}{240} \times \frac{1}{1} \times \frac{3}{100} = \frac{£34399}{4800} = £17 \text{ } 11s. \text{ } 7\frac{5}{8}d.$$

$$\therefore \text{difference} = £19 \text{ } 5s. - £17 \text{ } 11s. \text{ } 7\frac{5}{8}d. = £1 \text{ } 13s. \text{ } 4\frac{1}{20}d.$$

(77) If the hour-hand did not move they would be 13' apart in 7 minutes, but the hour-hand at the same time will have moved $\frac{1}{12}$ th of the space.

$$\therefore 1 - \frac{1}{12} : 1 :: 7 \text{ min.} : 7\frac{7}{11} \text{ minutes past 4.}$$

(78) If the hour-hand did not move they would be together in 30 minutes, but the hour-hand at the same time will have moved $\frac{1}{12}$ th of the space.

$$\therefore 1 - \frac{1}{12} : 1 :: 30 \text{ min.} : 32\frac{8}{11} \text{ minutes past 6.}$$

(79) No. of grs. in $2\frac{1}{2}$ lbs. Av. = $7000 \times 2\frac{1}{2} = 15400$.

$$\therefore \text{difference} = 15432 \cdot 3487 - 15400 = 32 \cdot 3487 \text{ grs.}$$

(80) £100 stk. : £12500 stk. :: £6 $\frac{1}{2}$: $\frac{12500 \times 13}{100 \times 2}l. = £812 \text{ } 10s. \text{ } 1st \text{ income.}$

$$£100 \text{ stk.} : £12500 \text{ stk.} :: £185\frac{1}{4} : \frac{12500 \times 743}{100 \times 4}l. = \frac{£92875}{4} \\ = £23218\frac{3}{4} \text{ capital.}$$

$$£92\frac{7}{8} : £23218\frac{3}{4} :: £3 : \frac{92875 \times 3 \times 8}{743 \times 4}l. = £750 \text{ } 2nd \text{ income.}$$

$$\therefore \text{loss in income} = £812 \text{ } 10s. - £750 = £62 \text{ } 10s.$$

(81) i. $\cdot 004 | 096 \quad (\cdot 16$

$$\begin{array}{r|l} 1 & \\ 1^2 \times 300 = 300 & 3096 \\ 1 \times 30 \times 6 = 180 & \\ 6^2 = 36 & \\ \hline 516 & 3096 \end{array}$$

$$\text{ii. } 1.17361 = 1 \frac{17361-1736}{90000} = 1 \frac{15625}{90000} = 1 \frac{25}{144}. \quad \sqrt{\frac{15625}{144}} = \frac{125}{12} = 1.083.$$

- 2) $\frac{1}{4}$ of 128 = 32 gallons drawn off \therefore 128 - 32 = 96 gallons left.

$$\frac{1}{4} \text{ " } 96 = 24 \text{ " " } \therefore 96 - 24 = 72 \text{ " "}$$

$$\frac{1}{4} \text{ " } 72 = 18 \text{ " " } \therefore 72 - 18 = 54 \text{ " "}$$

$$\frac{1}{4} \text{ " } 54 = 13\frac{1}{2} \text{ " " } \therefore 54 - 13\frac{1}{2} = 40\frac{1}{2} \text{ " "}$$

$$\therefore \frac{40\frac{1}{2}}{128} = \frac{81}{2} \times \frac{1}{128} = \frac{81}{256} \text{ of the original quantity left.}$$

- 3) Weight of six spoons = 7 oz. 4 dwts. 4 grs. $\times 6 = 43$ oz. 5 dwts. or 3 lbs. 7 oz. 5 dwts.

$$\text{Excess} = 3 \text{ lbs. } 7 \text{ oz. } 5 \text{ dwts.} - 3 \text{ lbs. } 0 \text{ oz. } 6 \text{ dwts.} = 6 \text{ oz. } 19 \text{ dwts.}$$

- 4) Rise of meat and reduction in daily allowance = $\frac{1}{8} - \frac{1}{9} = \frac{1}{72}$.

$$\therefore \text{increase} = \frac{597}{1} \times \frac{1}{72} = £53 \text{ } 1\text{s. } 4\text{d.}$$

$$\text{Yearly charge before rise and reduction} = £597 - £53 \text{ } 1\text{s. } 4\text{d.} = £543 \text{ } 18\text{s. } 8\text{d.}$$

- 5) 67 ft. = 804 in.

$$\therefore \text{number of lengths} = \frac{804}{1} + 6\frac{1}{4} = 128 \text{ with } 4 \text{ in. over.}$$

- 3) 3d. in the £ = $\frac{1}{80}$ of income.

$$\therefore 1 - \frac{1}{80} \text{ or } \frac{79}{80} \text{ remaining represents } £448 \text{ } 6\text{s. } 6\text{d.}$$

$$\therefore \frac{79}{80} : 1 :: £448\frac{13}{40} : \frac{17933 \times 80}{40 \times 79} \text{ } l. = £454 \text{ gross income.}$$

- 7) If the hour-hand did not move they would be at right angles in 10 minutes, but the hour-hand at the same time will have moved $\frac{1}{12}$ th of the space.

$$\therefore 1 - \frac{1}{12} : 1 :: 10 \text{ min. } : \frac{12 \times 10}{11} = 10\frac{10}{11} \text{ min. past } 5.$$

- 8) In the new mixture there are 28 measures of water to 4 of wine.

$$\text{Or water : wine as } 7 : 1.$$

$$\therefore \text{quantity of water to be added} = 32 \times 7 = 224 \text{ measures.}$$

- 9) Selling price of whole = $1\frac{1}{10}$ of £25 = £27 $\frac{1}{2}$.

$$\text{As } 8 \text{ gallons are lost in leakage there remains } 30 \text{ gallons.}$$

$$\therefore \text{selling price per gallon} = £27\frac{1}{2} \div 30 = 18\text{s. } 4\text{d.}$$

(90) Let charge of 1st be represented by 1 \therefore charge of second will be $1\frac{1}{3}$.

$\therefore 1\frac{1}{3} : 36 :: 7 : 189$ shots from 2nd.

$1\frac{1}{3} : 36 :: 8 : 216$ } shots from 1st.
36

441 shots from both.

(91) Diagonal of square = root of twice the area.

\therefore diagonal = $\sqrt{2(2 \times 4840 \times 9 \times 144)}$ in. = 5009 in. = 139 yds. 5 in.

(92) i. $\pounds 98 - 1\frac{1}{2} : \pounds 2500 :: \pounds 100 \text{ stk.} : \frac{100 \times 2500 \times 2}{193} \text{ l.} = \pounds \frac{500000}{193}$
= $\pounds 2590\frac{130}{193}$ stock.

ii. $\pounds 98 - 1\frac{1}{2} : \pounds 100 :: \pounds 9 : \frac{100 \times 2 \times 9}{193} = \frac{1800}{193} = 9\frac{63}{193}$ interest.

(93)

Let b = the breadth

$5b$ = the height

$40b$ = the length

$\therefore 200b^2 = 18225$

$b^2 = \frac{18225}{200}$ or $\frac{729}{8}$

$\therefore b = \frac{9}{2}$ or $4\frac{1}{2}$ ft.

(94) i. $\pounds 92 : \pounds 6900 :: \pounds 100 \text{ stk.} : \frac{6900 \times 100}{92} \text{ l.} = \pounds 7500$ stock.

ii. $\pounds 100 \text{ stk.} : \pounds 7500 \text{ stk.} :: \pounds 3 : \frac{7500 \times 3}{100} \text{ l.} = \pounds 225$ income from
1st investment.

$\pounds 100 \text{ stk.} : \pounds 6900 \text{ stk.} :: \pounds 110 : \frac{6900 \times 110}{100} \text{ l.} = \pounds 7590$ stock.

$\pounds 100 \text{ stk.} : \pounds 7590 \text{ stk.} :: \pounds 2\frac{1}{2} : \frac{7590 \times 5}{100 \times 2} \text{ l.} = \pounds 189 \text{ 15s.}$ in-
come from 2nd investment.

\therefore difference = $\pounds 225 - \pounds 189 \text{ 15s.} = \pounds 35 \text{ 5s.}$

(95) It is evident that A does as much in $22\frac{1}{2}$ days as B does in $22\frac{1}{2}$ + 18 or $40\frac{1}{2}$ days.

$\therefore A$'s walking : B 's walking as $40\frac{1}{2} : 22\frac{1}{2}$ or as 9 : 5.

\therefore if A walks 18 miles in one day, B will have walked 10.

(96) 3605 ft. 64 in. = 6229504 c. in.

	6|229|504 (184 in. = 15 ft. 4 in. edge.
	1
$1^2 \times 300 = 300$	5229
$1 \times 30 \times 8 = 240$	
$8^2 = 64$	
604	4832
$18^2 \times 300 = 97200$	397504
$18 \times 30 \times 4 = 2160$	
$4^2 = 16$	
99376	397504

(97) i. $2 \cdot 370 = 2\frac{370}{999} = 2\frac{10}{27} = \frac{64}{27} \therefore$ edge = $\sqrt[3]{\frac{64}{27}} = \frac{4}{3}$ yds. = 4 ft.

ii. Diagonal of face = $\sqrt{(4)^2 + (4)^2} = \sqrt{32}$.

\therefore diagonal = $\sqrt{\sqrt{(32)^2 + (4)^2}} = \sqrt{48} = 6 \cdot 92$ ft. &c.

iii. Area to be painted = (4×4) ft. $\times 6$.

Cost of painting = $(1\frac{4}{9} \times 1\frac{6}{9} \times \frac{6}{9}) = \frac{1248}{9} s. = £6 \text{ } 18s. \text{ } 8d.$

(98) Contents = 659 ft. 1248 in. = 1140000 c. in.

Area of base = 26 ft. 6 in. = 3750 sq. in.

\therefore height = $1140000 \div 3750 = 304$ in. = 25 ft. 4 in.

(99) The one gains on the other 22 miles an hour.

$\therefore 22 \text{ mls.} : 150 \text{ yds.} :: 1 \text{ hr.} : 13\frac{229}{242} \text{ seconds.}$

(100) $56 + 41 = 97 \therefore 100 - 97 = 3$ per cent., which is equal to £15000 of receipts.

£3 : £100 :: £15000 : £500000 the whole receipts.

Amount paid to shareholders = $\frac{500000 \times 56}{100} = £280000.$

\therefore capital = $\frac{280000 \times 100}{3\frac{1}{2}} = £8000000.$

PAPER I., p. 174. (NAVY.)

$$\begin{array}{r}
 \text{(1)} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 204080 \cdot 17 \quad 9\frac{1}{2} \\ \hline 20 \\ 4081617\text{s.} \\ \hline 12 \\ 48979413\text{d.} \\ \hline 4 \end{array}
 \end{array}$$

195917654f. = one hundred and ninety-five millions, nine hundred and seventeen thousand, six hundred and fifty-four

$$\begin{array}{r}
 \text{(2)} \quad \begin{array}{r|l} 10\text{s.} & \frac{1}{2} \\ 2\text{s.} & \frac{1}{5} \\ 6\text{s.} & \frac{1}{4} \\ 3\text{d.} & \frac{1}{2} \\ \frac{1}{2}\text{d.} & \frac{1}{8} \end{array} \quad \begin{array}{l} 96048 \text{ articles @ } £1 \ 12\text{s.} \ 9\frac{1}{2}\text{d. each} \\ 48024 \\ 9604 \ 16 \\ 2401 \ 4 \\ 1200 \ 12 \\ 200 \ 2 \\ \hline £157478 \ 14\text{s.} \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(3)} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 6352) 492710 \ 1 \ 8 \ (\text{£}77 \ 11\text{s.} \ 4\frac{1}{2}\text{d.} \\ \hline 44464 \\ 48070 \\ \hline 44464 \\ 3606 \\ \hline 20 \\ 72121 \\ \hline 6352 \\ 8601 \\ \hline 6352 \\ 2249 \\ \hline 12 \\ 26996 \\ \hline 25408 \\ 1588 \\ \hline 4 \\ 6352 \\ \hline 6352 \\ \hline \dots \end{array}
 \end{array}$$

- (4) Weight of 379 packages = 4 tons 3 qrs. 1 lb. - 1 ton 10 cwt.
= 2 tons 10 cwt. 3 qrs. 1 lb.

∴ weight of each package = 2 tons 10 cwt. 3 qrs. 1 lb. ÷ 379
= 15 lbs.

- (5) As 27s. : 35s. :: 480A : $\frac{35 \times 480}{27}$ A. = $\frac{5600}{9}$ A. = 622A. 0B. 35P. $16\frac{2}{3}$ yds.

		£	s.	d.
(6) 10 dwts.	$\frac{1}{2}$	0	7	6
			13	
		5	0	9
5 dwts.	$\frac{1}{2}$	3	10	$\frac{1}{2}$
2 dwts.	$\frac{1}{5}$	1	11	$\frac{1}{4}$
16 grs.	$\frac{1}{3}$		9	$\frac{2}{10}$
			3	$\frac{1}{10}$
		£5	7s.	7 $\frac{3}{10}$ d.

- (7) As 9 mls. : 32 mls. :: $6\frac{1}{2}$ hrs. : $\frac{32 \times 27}{9 \times 4}$ hrs. = 24 hours.

- (8) $\left. \begin{array}{l} 112 \text{ bus.} : 60 \text{ bus.} \\ 4 \text{ dys.} : 16 \text{ dys.} \end{array} \right\} :: 28 \text{ horses.}$

Then $\frac{60 \times 16 \times 28}{112 \times 4} = 60 \text{ horses.}$

- (9) Circumference of wheel = 1 mile 467 yds. 1 ft. ÷ 514 = 4 yds. 1 ft.

$$(10) 5\frac{1}{2} - 4\frac{1}{2} + \frac{5}{28} - 1\frac{1}{2} = \frac{21 - 4 + 5 - 14}{28} = \frac{8}{28} = \frac{2}{7}.$$

$$(11) (2\frac{1}{4} + 3\frac{1}{3}) - (\frac{1}{3} \times \frac{2}{5} \times \frac{5}{7} \times \frac{3}{8}) = \frac{27}{40} - \frac{1}{28} = \frac{189 - 10}{280} = \frac{179}{280}.$$

$$(12) \frac{256}{7} = 36.571428; 3.75 = 3\frac{75}{100} = 3\frac{3}{4}.$$

$$(13) \frac{£2 \text{ 8s. } 9d.}{£5} = \frac{27}{5} = \frac{88}{5} \times \frac{1}{5} = \frac{88}{25}.$$

(14) $\begin{array}{r} .00037) 18.13 \text{ (49000)} \\ \underline{148} \\ 333 \\ \underline{333} \\ \dots \end{array}$

	£	s.	d.
(15) $3.049 \times £1$	= 3	0	$11\frac{9}{25}$
$.0425 \times £100$	= 4	5	0
$.432 \times 13s. 4d.$	= 0	5	$9\frac{3}{25}$
$\therefore \text{sum} = £7 \quad 11s. \quad 8\frac{23}{25}d.$			

(16) Cost price per cwt. = $6\frac{1}{2}d.$ + $1\frac{1}{4}d.$ or $7\frac{3}{4}d.$ $\times 112 \text{ lbs.} = 86$
 $= £3 \text{ } 12s. \text{ } 4d.$

$\therefore \text{gain} = £4 \text{ } 10s. - £3 \text{ } 12s. \text{ } 4d. = 17s. \text{ } 8d.$

(17) Value of bar = $£4.0099 \times (1.683 \times 12) \text{ oz.} = 4\frac{1}{100} \times 14\frac{1}{10} \times$
 $= \frac{405}{101} \times \frac{101}{100} \times \frac{12}{1} = £81.$

(18) Number of inches too short = $\frac{2}{3} \times \frac{21}{2} = 7 \text{ in.}$

$\therefore \text{true length} = 10 \text{ yds. } 1 \text{ ft. } 6 \text{ in.} - 7 \text{ in.} = 10 \text{ yds. } 0 \text{ ft. } 11 \text{ in.}$

(19) Cost price per lb. = $£7 + 112 = 1s. \text{ } 3d.$

$\therefore \text{selling price} = 1\frac{1}{10} \text{ of } 1s. \text{ } 3d. = 1s. \text{ } 4\frac{1}{2}d.$

(20) $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{6+3+2}{12} = \frac{11}{12}.$

$\therefore 1 - \frac{11}{12}$ or $\frac{1}{12}$ of the orchard is equal to 50 trees.

$\therefore \text{number of trees} = 50 \times 12 = 600.$

PAPER II., p. 175. (CONTROL.)

(1) $4 \text{ tons } 7 \text{ cwt. } 1 \text{ qr. } 13 \text{ lbs. } 12 \text{ oz.}$

20

87 cwt.

4

349 qrs.

28

2805

698

9785 lbs.

16

58722

9785

156572 oz.

(2) As 13 lbs. : 213 lbs. :: $4s. \text{ } 10\frac{1}{2}d.$: $\frac{213 \times 117}{13 \times 480}l. = £\frac{939}{160}$
 $= £3 \text{ } 19s. \text{ } 10\frac{1}{2}d.$

(3)
$$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 5 \quad 12 \quad 6 @ 3 \text{ tons 3 cwt. per ton.} \\ 3 \end{array}$$

$$\begin{array}{l} 2 \text{ cwt.} = \frac{1}{10} \text{ of 1 ton} \\ 1 \text{ cwt.} = \frac{1}{2} \text{ of 2 cwt.} \end{array} \quad \begin{array}{r} 16 \quad 17 \quad 6 \\ 11 \quad 3 \\ 5 \quad 7\frac{1}{2} \\ \hline \text{£}17 \quad 14\text{s.} \quad 4\frac{1}{2}\text{d.} \end{array}$$

(4) Interest = $\frac{106\frac{2}{3} \times 1\frac{1}{4} \times 4\frac{1}{2}}{100} \text{ l.} = \frac{320 \times 5 \times 9}{100 \times 3 \times 4 \times 2} \text{ l.} = \text{£}6.$

(5) $3\frac{1}{8} + \frac{2}{3} + 1\frac{4}{15} + \frac{39}{40} = 4 + \frac{15 + 80 + 32 + 117}{120} = \frac{244}{120} = 6\frac{1}{30}.$

(6) $6\frac{7}{12} - 5\frac{4}{9} = 1 + \frac{21 - 16}{36} = 1\frac{5}{36}.$

(7) $12\frac{3}{8} \times 1\frac{5}{11} = \frac{99}{8} \times \frac{16}{11} = 18.$

(8) $4\frac{2}{3} + 13\frac{1}{8} = \frac{14}{3} \times \frac{8}{105} = \frac{16}{45}.$

(9) 999·0101643.

(10) 34·83145.

(11) 302·468

(12) 361·059) 78·0000 (·21603

400

722118

120987·2000

578820

A.

(14)

2) 164723 pts.

361059

(13) 3·8375

4) 82361 . 1 pt.

2177610

4

2) 20590 . 1 qt.

2166354

3·3500

4) 10295 . 0 gal.

1125600

40

8) 2573 . 3 pks.

1083177

14·00

42423

3A. 3R. 14P.

321 qrs. 5 bus. 3 pks. 1 qt. 1 pt.

(16)
$$\begin{array}{l} 10\text{s.} = \frac{1}{2} \text{ of £}1 \\ 4\text{s.} = \frac{1}{5} \text{ of £}1 \\ 2\text{d.} = \frac{1}{24} \text{ of 4s.} \end{array} \quad \begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 721 \quad 13 \quad 6 \\ 360 \quad 16 \quad 9 \\ 144 \quad 6 \quad 8\frac{2}{5} \\ 6 \quad 0 \quad 3\frac{7}{20} \\ \hline \text{£}511 \quad 3\text{s.} \quad 8\frac{1}{4}\text{d.} \end{array}$$

(15) 20A. : 6A.

1½ dys. : 6 dys.

8 hrs. : 14 hrs.

} :: 15 men. Then $\frac{6 \times 6 \times 14 \times 15 \times 4}{20 \times 7 \times 8} = 27$ men.

∴ No. of men employed = 27 - 10 = 17 men.

$$(17) 2\frac{1}{2} \text{ p.c.} = \frac{5}{200} = \frac{1}{40}; M = (1\frac{1}{40})^2 \times £8900.$$

$$\text{Amount} = \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40} \times \frac{8900}{1} = £\frac{6133969}{840} = £9584 \text{ 6s. } 6\frac{2}{3}d.$$

$$(18) \frac{14}{17} + 3\frac{1}{5} + 1\frac{5}{51} + \frac{9}{27} = 4 + \frac{378 + 51 + 45 + 102}{459} = 4\frac{576}{459} = 5\frac{117}{459} = 5\frac{13}{51}.$$

$$(19) 6\frac{1}{3} - 5\frac{4}{13} = 1 + \frac{13 - 36}{117} = \frac{94}{117}.$$

$$(20) 4\frac{1}{3} \times \frac{16}{21} \times \frac{14}{11} \times \frac{1}{2} = \frac{32}{3} \times \frac{16}{21} \times \frac{14}{11} \times \frac{1}{2} = 2.$$

$$(21) 3\frac{1}{5} + \frac{17}{23} = 3\frac{4}{5} + \frac{92}{115} = 14.$$

$$(22) 634\cdot898367.$$

$$(23) 26\cdot31772.$$

$$(24) \begin{array}{r} 40\cdot061 \\ \cdot0054 \\ \hline 160244 \\ 200305 \\ \hline 2163294 \end{array}$$

$$(25) \begin{array}{r} 0\cdot009207 \cdot 055757592 \text{ (6}\cdot056 \\ \hline 55242 \\ \hline 51559 \\ \hline 46035 \\ \hline 55242 \\ \hline 55242 \\ \hline \dots \end{array}$$

$$(26) \frac{33 \text{ yds.}}{1 \text{ mile}} = \frac{33 \text{ yds.}}{1760 \text{ yds.}} = \cdot01875.$$

(27) If 1 represent the single ticket, $1\frac{1}{2}$ will be the return ticket
 \therefore whole sum paid = $1 + \frac{1}{4} + (1\frac{1}{4} \text{ of } \frac{1}{20}) = 1\frac{5}{16}$. As $1\frac{5}{16}$ equals
 $£2 \text{ 12s. } 6d.$, what will 1 or single ticket equal?

$$1\frac{5}{16} : 1 :: £2\frac{5}{8} : \frac{21 \times 16}{8 \times 21} = £2.$$

$$(28) \begin{array}{r} 9|555|119|848 \text{ (2122} \\ 8 \end{array}$$

$$\begin{array}{r|l} 2^2 \times 300 = 1200 & 1555 \\ 2 \times 30 \times 1 = 60 & \\ 1^2 = 1 & \\ \hline 1261 & 1261 \\ 21^2 \times 300 = 132300 & 294119 \\ 21 \times 30 \times 2 = 1260 & \\ 2^2 = 4 & \\ \hline 133564 & 267128 \\ 212^2 \times 300 = 13483200 & 26991848 \\ 212 \times 30 \times 2 = 12720 & \\ 2^2 = 4 & \\ \hline 13495924 & 26991848 \end{array}$$

$$9) \text{ As } £87\frac{1}{2} : £100 :: £3 : \frac{100 \times 3 \times 2}{175} = 3\frac{4}{7} = 3\frac{3}{7} \text{ 1st income.}$$

$$\text{As } £130\frac{1}{4} : £100 :: £5 : \frac{100 \times 5 \times 4}{521} = \frac{2000}{521} = 3\frac{437}{521} \text{ 2nd income.}$$

Difference = $3\frac{437}{521} - 3\frac{3}{7} = \frac{1496}{3647} \therefore$ the most profitable investment is in the 5 per Cents at $130\frac{1}{4}$.

$$\text{As } £\frac{1496}{3647} : £561 :: £100 : \frac{561 \times 100 \times 3647}{1496} = \frac{272525}{2} \\ = £136762 \text{ 10s.}$$

$$0) \cdot 2671875 = \frac{2671875 - 267}{9999000} = \frac{2671608}{9999000} = \frac{111317}{416825}.$$

$$\therefore \frac{111317}{416825} \times \frac{6}{1} = £\frac{222634}{138875} = £1 \text{ 12s. } 0\frac{20832}{27775}d.$$

$$1) 111540 = 2^2 \times 3 \times 5 \times 11 \times 13$$

$$42336 = 2^5 \times 3^2 \times 7^2$$

$$67392 = 2^5 \times 3^4 \times 13$$

$$12) \begin{array}{r} 111540, 42336, 67392 \\ \hline 9295, \quad 3528, \quad 5616 \end{array}$$

$$\therefore \text{L.C.M.} = 12 \times 9295 \times 3528 \times 5616 = 2209969681920.$$

$$2) 62 \cdot 35 \text{ lbs.} = 62\frac{22}{90} = 62\frac{11}{45} \text{ lbs. ; and } 1000 \text{ oz.} = 62\frac{1}{2} \text{ lbs.}$$

$$\therefore \text{difference in the weight of 1 c. ft. of water} = 62\frac{1}{2} - 62\frac{11}{45} = \frac{13}{90} \text{ lbs.}$$

$$\therefore \text{error in calculating the weight of 1000 c. ft.} = \frac{13}{90} \times \frac{1000}{1} = \frac{1300}{9} \text{ lbs.} \\ = 144\frac{4}{9} \text{ lbs.}$$

PAPER III., p. 176. (CIVIL SERVICE.)

$$1) \frac{1}{2600} \text{ of } £10 \text{ 16s. } 8d. = \frac{1}{2600} \times \frac{2600}{1} = 1d.$$

$$\therefore 1d. \text{ to the dec. of } £4 \text{ 3s. } 4d. = 1d. + 1000d. = \cdot 001.$$

$$2) 186 \text{ yds. } 2 \text{ ft. } 8\frac{1}{25} \text{ in.} = \frac{168201}{25} \text{ in. ; and } 22 \text{ yds.} = 792 \text{ in.}$$

$$\therefore \frac{168201}{25} \div 792 = 8 \cdot 495 \text{ chains.}$$

$$\text{And } 8 \cdot 495 \text{ chains} = 8 \text{ chains } 4 \text{ chainlets } 9 \text{ links } 5 \text{ linkets.}$$

$$3) \text{ Wt. of coin} = (19 \cdot 3 \times 11) + (8 \cdot 89 \times 1) = 212 \cdot 3 + 8 \cdot 89 = 221 \cdot 19.$$

$$4) \text{ As } 2 \times 28 \text{ in.} : 35 \text{ mls.} :: 1 \text{ sec.} : \frac{35 \times 1760 \times 36 \text{ in.}}{2 \times 28 \text{ in.} \times 60 \times 60} \text{ hrs.} = 11 \text{ hrs.}$$

- (5) Merchant's gain is £60 on every £100 worth of tea sold.
 If he received no payment he would lose £100 - £60, or £40, on every £100 of tea sold.
 But he received 2s. 6d. in the £, or £12½ in £100.
 \therefore loss = £40 - £12½ = £27½.

(6)

ft.	in.				
6	1	3'			
8	7	2			
<hr/>					
48	10	0			
3	6	8	9		
	1	0	2	6	
<hr/>					
52	5	8	11	6	
8	7				
<hr/>					
419	9	11	8	0	
30	7	4	2	8	6
<hr/>					
450	5	3'	10"	8'''	6''' = 450 c. ft. 766½ c. in.
	12				
	63				
	12				
	766½ in.				$\frac{8}{12} + \frac{6}{144} = \frac{51}{72}$.

(7) i. $P + \frac{P \times \frac{5}{1} \times 1}{\frac{100}{20}} = \frac{100}{1} \therefore P = \frac{100}{1} \times \frac{20}{21} = \frac{2000}{21} = £95 \text{ 4s. } 9\frac{1}{2}d.$

$\therefore D = £100 - £95 \text{ 4s. } 9\frac{1}{2}d. = £4 \text{ 15s. } 2\frac{1}{2}d.$

ii. £100 stk. : £800 stk. :: £3 : $\frac{3 \times 800}{100}l. = £24 \text{ 1st income.}$

£100 stk. : £500 stk. :: £3 : $\frac{500 \times 3}{100}l. = £15 \text{ 2nd income.}$

\therefore total income = £24 + £15 = £39.

Income tax = $\frac{7}{240} \times \frac{39}{1} = \frac{273}{80} = £1 \text{ 2s. } 9d.$

\therefore net income = £39 - £1 2s. 9d. = £37 17s. 3d. = $\frac{3029}{80}$.

£1165 : £100 :: $\frac{3029}{80} : \frac{100 \times 3029}{1165 \times 80} = \frac{13}{4} = 3\frac{1}{4} \text{ p.c.}$

(8) Area of rectangle = 513 yds. 1 ft. 11 in. \times 1628 yds. 11 in. = 18491 \times 58619 = 1083923929 in.

\therefore side of square = $\sqrt{1083923929} = 32923 \text{ in.} = 914 \text{ yds. } 1 \text{ ft. } 7 \text{ in.}$

$$(9) \sqrt[3]{1277289 \frac{27}{216}} = \sqrt[3]{\frac{2775694451}{216}} = \frac{951}{6} = 108 \frac{1}{2}.$$

	275|894|451 (651 216
$6^2 \times 300 = 10800$	59894
$6 \times 30 \times 5 = 900$	
$5^2 = 25$	58625
<u>11725</u>	
$65^2 \times 300 = 1267500$	1269451
$65 \times 30 \times 1 = 1950$	
$1^2 = 1$	1269451
<u>1269451</u>	

$$(10) \text{ No. of yds.} = \frac{1}{3}(25 \cdot 3 \times 28 \cdot 8 + 2 \cdot 16) = \frac{76}{3} \times \frac{260}{9} \times \frac{6}{13} \times \frac{1}{3} = \frac{3040}{27} \text{ yds.} \\ = 112 \text{ yds. } 1 \frac{2}{3} \text{ ft.}$$

$$(11) 2A. 3R. 6P. \text{ or } 12291 \cdot 5 \text{ yds.} + 5 \cdot 12 = 2400 \cdot 6 \text{ sq. yds.}$$

$$(12) \left. \begin{array}{l} 1 : 2 \\ \frac{1}{10} : 1 \\ 3 : 2 \end{array} \right\} :: 75 \text{ men. Then } \frac{2 \times 1 \times 2 \times 75 \times 10}{1 \times 3} = 1000 \text{ men.}$$

PAPER IV., p. 177. (CIVIL SERVICE.)

$$(1) 4d. \text{ in the } £ = \frac{1}{80} \text{ of income } \therefore 1 - \frac{1}{80} \text{ or } \frac{79}{80} \text{ is remaining.}$$

$$\frac{79}{80} : 1 :: £642 \frac{1}{3} : \frac{1927 \times 60}{59 \times 3} l. = \frac{38540}{59} = £653 \text{ 4s. } 4 \frac{52}{59} d.$$

		$£ \quad s. \quad d.$
(2)	2R. $\frac{1}{2}$	161 6 8
		5
		806 13 4
	1R. $\frac{1}{2}$	80 13 4
	5 pls. $\frac{1}{8}$	40 6 8
	2 pls. $\frac{1}{20}$	5 0 10
	88 yds. $\frac{1}{55} A.$	2 0 4
		2 18 8
		£937 13s. 2d.

$$(3) 30 \text{ chains } 15 \text{ links} = 663 \frac{3}{10} \text{ yds.}; \text{ and } 3 \text{ fur. } 6 \text{ rods} = 693 \text{ yds.} \\ \therefore \text{ difference} = 693 \text{ yds.} - 663 \frac{3}{10} \text{ yds.} = 29 \frac{7}{10} \text{ yds.}$$

$$(4) \text{ Cost price per lb.} = 4 \frac{1}{2} \times \frac{100}{90} = \frac{85}{18} d. \\ \therefore \text{ cost price per cwt.} = \frac{85}{18} \times \frac{1}{240} \times \frac{112}{1} = £ \frac{133}{64} = £2 \text{ 9s. } 3 \frac{1}{8} d.$$

$$(5) P + \frac{P \times \frac{1}{4} \times 43}{100 \times \frac{8}{2}} = £455\frac{5}{8} \therefore P = \frac{3645}{8} \times \frac{200}{243} = £375.$$

$$(6) \text{Area of walls} = \{2(27\frac{1}{2} + 21\frac{1}{2}) \times 12\} \text{ sq. ft.} \\ \therefore \text{cost} = \{(98 \times 12) \text{ sq. ft.} \times £\frac{9}{40}\} \div (\frac{12}{1} \times \frac{3}{4} \times \frac{9}{1}) \text{ sq. ft.} = \frac{98 \times 12}{1} \times \frac{9}{40} \\ \times \frac{1}{12} \times \frac{4}{3} \times \frac{1}{9} = £\frac{49}{15} = £3 \text{ } 5s. \text{ } 4d.$$

(7) Diagonal of square = the root of twice the area.

$$\text{Diagonal} = \sqrt{3\frac{1}{2} \text{A.} \times 2} = \sqrt{33880} \text{ yds.} = 184.06 \text{ yds.}$$

	ft.	in.	
(8)	13	5	7"
	9	3	11
	121	2	3
	3	4	4
	1	0	4
	125	6	11'
		12	10''
		83	125 in.
			5''' = 125 sq. ft. 83

$$(9) £100 \text{ stk.} : £6250 \text{ stk.} :: £6\frac{1}{2} : \frac{6250 \times 13}{100 \times 2} l. = £\frac{1625}{4} = £406 \text{ } 5s. \\ \text{1st income.}$$

$$£100 \text{ stk.} : £6250 \text{ stk.} :: £185\frac{5}{8} : \frac{6250 \times 1486}{100 \times 8} l. = \frac{125 \times 743}{8} l. \\ \text{sterling.}$$

$$£92\frac{7}{8} : \frac{125 \times 743}{8} l. :: £3 : \frac{125 \times 743 \times 3 \times 8}{743 \times 8} l. = £375 \text{ 2nd income.} \\ \therefore \text{loss} = £406 \text{ } 5s. - £375 = £31 \text{ } 5s.$$

$$(10) \text{Height of parallelopiped} = (659 \text{ ft. } 1248 \text{ in.} + 26 \text{ ft. } 6 \text{ in.}) \\ = (1140000 \text{ in.} + 3750 \text{ in.}) = 304 \text{ in.} = 25 \text{ ft. } 4 \text{ in.}$$

$$(11) i. \quad 18 \cdot 962 | 962 \quad (2.66 \text{ yds.} = 8 \text{ ft. edge.})$$

	2 ² × 300 = 1200	10962
	2 × 30 × 6 = 360	
	6 ² = 36	
	1596	9576
	26 ² × 300 = 202800	1386962
	26 × 30 × 6 = 4680	
	6 ² = 36	
	207516	1245096

ii. Diagonal of face = $\sqrt{(8)^2 + (8)^2} = \sqrt{128}$.

\therefore diagonal of cube = $\sqrt{(128) + (8)^2} = 13.8$ ft. &c.

iii. Area of one face = $8 \times 8 = 64$ sq. ft.

(12) Watch loses from Monday to Saturday $3' 10'' \times 5 = 15' 50''$.

If in 24 hrs. the watch loses $3' 10''$, what will it lose in $22\frac{1}{2}$ hrs.?

$\therefore 24 \text{ hrs.} : 22\frac{1}{2} \text{ hrs.} :: 3\frac{1}{8}' : \frac{89 \times 19}{4 \times 6 \times 24} = \frac{1691}{576} = 2' 56\frac{7}{48}''$ loss from

12 o'clock on Saturday to Sunday 10.15 a.m.

\therefore time by watch at 10.15 a.m. on Sunday morning = 10 hrs. 15 min.

$- \{(15' 50'' + 2' 56\frac{7}{48}'') - 10'\} = 10 \text{ hrs. } 6' 13\frac{41}{48}''$.

(13) Number of years (not including leap year) = $30000 + 365 = 82$ years
70 days.

But in 82 yrs. leap year occurs 20 times.

\therefore his true age is 82 yrs. 50 dys.

\therefore year and day of birth = 1875 yrs. 135 dys. - 82 yrs. 50 dys.
= 1793 yrs. 85 dys., or March 26th, 1793.

(14) $10.56249 = 10\frac{50625}{90000} = 10\frac{9}{18}$.

$\sqrt{10\frac{9}{18}} = \sqrt{1\frac{89}{18}} = \frac{13}{4} = 3.25$.

(15) No. of mètres in a mile = 1 mile $\div 39.371$ in. = 63360 in.
 $+ 39.371$ in. = 1609.306.

1000 mètres = 39371 in. \therefore 1 kilomètre = 39371 in. = 1093 yds.
1 ft. 11 in.

EXERCISE LXXXIII., p. 181.

(1) 3726 mils.

(2) 397 mils.

£

£

(3) 13.734

(4) 3.645

27.009

2.567

15.037

$\pounds 1.078 = \pounds 1 \text{ 7 c. 8 m.}$

.046

$\pounds 55.826 = \pounds 55 \text{ 8 fl. 2 c. 6 m.}$

£

£

(5) 18.907

(6) .832

29

35

170163

4160

37814

2496

$\pounds 548.303 = \pounds 548 \text{ 3 fl. 3 m.}$

$\pounds 29.129 = \pounds 29 \text{ 1 fl. 2 c.}$

$$(7) \begin{array}{r} \text{£} \\ 15 \left\{ \begin{array}{l} 5) \overline{320\cdot775} \\ 3) \overline{64\cdot155} \end{array} \right. \end{array} \quad (8) \begin{array}{r} \text{£} \\ 37) \overline{97\cdot347} \quad (\text{£}2\cdot631 = \text{£}2\text{ fl. } 3\text{ c. } 1) \\ 74 \\ \hline 233 \\ 222 \\ \hline 114 \\ 111 \\ \hline 37 \\ 37 \\ \hline \dots \end{array}$$

$$\text{£}21\cdot385 = \text{£}21\text{ fl. } 8\text{ c. } 5\text{ m.}$$

$$(9) \begin{array}{r} \text{£} \\ \cdot875 \\ \hline 20 \\ \hline 17\cdot500\text{s.} \\ \hline 12 \\ \hline 6\cdot0\text{d.} \\ \hline 17\text{s. } 6\text{d.} \end{array}$$

$$(10) \begin{array}{r} \text{£} \\ 3\cdot305 \\ \hline 2\cdot78 \\ \hline \cdot115 \\ \hline \text{£}6\cdot200 \\ \hline 8 \\ \hline \text{£}49\cdot6 \\ \hline 20 \\ \hline 12\cdot0 \\ \hline \text{£}49\text{ } 12\text{s.} \end{array}$$

$$(11) \begin{array}{r} \text{£} \\ 3\cdot786 \\ \hline 2\cdot861 \\ \hline 5) \cdot925 \\ \hline \text{£}\cdot185 \\ \hline 20 \\ \hline 3\cdot700\text{s.} \\ \hline 12 \\ \hline 8\cdot4 = 8\frac{4}{10} = 8\frac{2}{5}\text{d.} \\ \hline 3\text{s. } 8\frac{2}{5}\text{d.} \end{array}$$

$$(12) \begin{array}{r} \text{£} \\ 7\cdot456 \\ \hline 20 \\ \hline 9\cdot120\text{s.} \\ \hline 12 \\ \hline 1\cdot44 = 1\frac{44}{100} = 1\frac{11}{25}\text{d.} \\ \hline \text{£}7\text{ } 9\text{s. } 1\frac{11}{25}\text{d.} \end{array}$$

$$\begin{array}{r} \text{£} \\ 31\cdot027 \\ \hline 20 \\ \hline \cdot540\text{s.} \\ \hline 12 \\ \hline 6\cdot48 = 6\frac{48}{100} = 6\frac{12}{25}\text{d.} \\ \hline \text{£}31\text{ } 0\text{s. } 6\frac{12}{25}\text{d.} \end{array}$$

$$\begin{array}{r} \text{£} \\ \cdot689 \\ \hline 20 \\ \hline 13\cdot780\text{s.} \\ \hline 12 \\ \hline 9\cdot36 = 9\frac{36}{100} = 9\frac{9}{25}\text{d.} \\ \hline 13\text{s. } 9\frac{9}{25}\text{d.} \end{array}$$

3) £29 15s. = £29 $\frac{3}{4}$ = £29.75 = £29 7 fl. 5 c.

12) 6.7500

20) 5.562500

£16.278125 = £16 2 fl. 7 c. 8.125 m.

20) 3.500

£7.175 = £7 1 fl. 7 c. 5 m.

4) 1 ton : 50 lbs. :: £8.512 : £190 or 3s. 9 $\frac{3}{4}$ d.

5) £45.384 : £31 :: £7.32 : £5.

3) £1.034 : £3.619 :: 100 miles : 350 miles.

$$\begin{array}{r} \text{£} \\ 7) \quad 7.346 \\ \quad \underline{14} \\ 29384 \\ \quad \underline{7346} \end{array}$$

£102.844

$$\begin{array}{r} \text{£} \quad \text{s.} \quad \text{d.} \\ 15 \left\{ \begin{array}{l} 5) 1600 \quad 17 \quad 6 \\ 3) 320 \quad 3 \quad 6 \end{array} \right. \\ \hline \text{£106 } 14\text{s. } 6\text{d.} = \text{£106.725} \end{array}$$

Difference = £106.725 - £102.844 = £3.881 = £3 8 fl. 8 c. 1 m.

∴ £1600 17s. 6d. ÷ 15 is the greater by £3 8 fl. 8 c. 1 m.

3) £5.467 - £1.964 = £0.503 × 8 = £4.024 = £4 0s. 5.76d.

9) 2d. : £84.375 :: £1 : £10125.

0) £3.702 = £3 14s. 0 $\frac{12}{25}$ d.; £7.406 = £7 8s. 1 $\frac{11}{25}$ d.

£.789 = 15s. 9 $\frac{9}{25}$ d.; £47.631 = £47 12s. 7 $\frac{11}{25}$ d.

∴ average = (£3 14s. 0 $\frac{12}{25}$ d. + £7 8s. 1 $\frac{11}{25}$ d. + 15s. 9 $\frac{9}{25}$ d. + £47 12s. 7 $\frac{11}{25}$ d.) ÷ 4 = £14 17s. 7 $\frac{17}{25}$ d.

$$\begin{array}{r} 1) \quad \begin{array}{l} 2 \text{ qrs.} \\ 1 \text{ qr.} \\ 14 \text{ lbs.} \\ 7 \text{ lbs.} \end{array} \left| \begin{array}{l} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right| \begin{array}{r} 20.25 \\ 6 \\ \hline 121.50 \\ 10.125 \\ 5.0625 \\ 2.53125 \\ \hline 1.265625 \end{array} \end{array}$$

£140.484375 = £140 4 fl. 8 c. 4.375 m.

$$\begin{array}{r} 2) \quad \begin{array}{l} 1 \text{ R.} \\ 8 \text{ p.} \end{array} \left| \begin{array}{l} \frac{1}{4} \\ \frac{1}{4} \end{array} \right| \begin{array}{r} \text{£} \\ 48.5 \\ 30 \\ \hline 1455.0 \\ 12.125 \\ 2.425 \end{array} \end{array}$$

£1469.550 = £1469 5 fl. 5 c.

EXERCISE LXXXIV., p. 183.

$$(1) 9^{\circ} \text{F} : 117^{\circ} \text{F} :: 5^{\circ} \text{C} : \frac{117 \times 5}{9} = 65^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : 117^{\circ} \text{F} :: 4^{\circ} \text{R} : \frac{117 \times 4}{9} = 52^{\circ} \text{R}.$$

$$(2) 5^{\circ} \text{C} : 60^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{60 \times 4}{5} = 48^{\circ} \text{R}.$$

$$5^{\circ} \text{C} : 60^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{60 \times 4}{5} = 108^{\circ} \text{F} + 32^{\circ} \text{F} = 140^{\circ} \text{F}.$$

$$(3) 4^{\circ} \text{R} : 20^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{20 \times 5}{4} = 25^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : 20^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{20 \times 9}{4} = 45^{\circ} \text{F} + 32^{\circ} \text{F} = 77^{\circ} \text{F}.$$

$$(4) 5^{\circ} \text{C} : 85^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{85 \times 4}{5} = 68^{\circ} \text{R}.$$

$$5^{\circ} \text{C} : 85^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{85 \times 9}{5} = 153^{\circ} \text{F} + 32^{\circ} \text{F} = 185^{\circ} \text{F}.$$

$$(5) 4^{\circ} \text{R} : 64^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{64 \times 9}{4} = 144^{\circ} \text{F} + 32^{\circ} \text{F} = 176^{\circ} \text{F}.$$

$$4^{\circ} \text{R} : 64^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{64 \times 5}{4} = 80^{\circ} \text{C}.$$

$$(6) 9^{\circ} \text{F} : (167^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{135 \times 5}{9} = 75^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (167^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{135 \times 4}{9} = 60^{\circ} \text{R}.$$

$$(7) 5^{\circ} \text{C} : 70^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{70 \times 4}{5} = 56^{\circ} \text{R}.$$

$$5^{\circ} \text{C} : 70^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{70 \times 9}{5} = 126^{\circ} \text{F} + 32^{\circ} \text{F} = 158^{\circ} \text{F}.$$

$$(8) 4^{\circ} \text{R} : 52^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{52 \times 9}{4} = 117^{\circ} \text{F} + 32^{\circ} \text{F} = 149^{\circ} \text{F}.$$

$$4^{\circ} \text{R} : 52^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{52 \times 5}{4} = 65^{\circ} \text{C}.$$

$$1) 9^{\circ} \text{F} : (86^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{54 \times 5}{9} = 30^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (86^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{54 \times 4}{9} = 24^{\circ} \text{R}.$$

$$2) 4^{\circ} \text{R} : 28^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{28 \times 5}{4} = 35^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : 28^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{28 \times 9}{4} = 63^{\circ} \text{F} + 32^{\circ} \text{F} = 95^{\circ} \text{F}.$$

$$1) 9^{\circ} \text{F} : (104^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{72 \times 4}{9} = 32^{\circ} \text{R}.$$

$$9^{\circ} \text{F} : (104^{\circ} \text{F} - 32^{\circ} \text{F}) : 5^{\circ} \text{C} : \frac{72 \times 5}{9} = 40^{\circ} \text{C}.$$

$$2) 5^{\circ} \text{C} : 45^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{45 \times 9}{5} = 81^{\circ} \text{F} + 32^{\circ} \text{F} = 113^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : 45^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{45 \times 4}{5} = 36^{\circ} \text{R}.$$

$$3) 9^{\circ} \text{F} : (50^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{18 \times 5}{9} = 10^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (50^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{18 \times 4}{9} = 8^{\circ} \text{R}.$$

$$4) 5^{\circ} \text{C} : 150^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{150 \times 9}{5} = 270^{\circ} \text{F} + 32^{\circ} \text{F} = 302^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : 150^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{150 \times 4}{5} = 120^{\circ} \text{R}.$$

$$5) 4^{\circ} \text{R} : 16^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{16 \times 9}{4} = 36^{\circ} \text{F} + 32^{\circ} \text{F} = 68^{\circ} \text{F}.$$

$$4^{\circ} \text{R} : 16^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{16 \times 5}{4} = 20^{\circ} \text{C}.$$

$$6) 9^{\circ} \text{F} : (77^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{45 \times 4}{9} = 20^{\circ} \text{R}.$$

$$9^{\circ} \text{F} : (77^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{45 \times 4}{9} = 25^{\circ} \text{C}.$$

$$7) 5^{\circ} \text{C} : 18^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{18 \times 9}{5} = 32.4^{\circ} \text{F} + 32^{\circ} \text{F} = 64.4^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : 18^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{18 \times 4}{5} = 14.4^{\circ} \text{R}.$$

$$(18) 5^{\circ} \text{C} : 75^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{75 \times 9}{5} = 135^{\circ} \text{F} + 32^{\circ} \text{F} = 167^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : 75^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{75 \times 4}{5} = 60^{\circ} \text{R}.$$

$$(19) 9^{\circ} \text{F} : (14^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{-18 \times 5}{9} = -10^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (14^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{-18 \times 4}{9} = -8^{\circ} \text{R}.$$

$$(20) 9^{\circ} \text{F} : (5^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{-27 \times 5}{9} = -15^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (5^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{-27 \times 4}{9} = -12^{\circ} \text{R}.$$

$$(21) 9^{\circ} \text{F} : (4^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{-28 \times 5}{9} = -\frac{140}{9}^{\circ} = -15\frac{5}{9}^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (4^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{-28 \times 4}{9} = -\frac{112}{9}^{\circ} = -12\frac{4}{9}^{\circ} \text{R}.$$

$$(22) 9^{\circ} \text{F} : (13^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{-19 \times 5}{9} = -\frac{95}{9}^{\circ} = -10\frac{5}{9}^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (13^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{-19 \times 4}{9} = -\frac{76}{9}^{\circ} = -8\frac{4}{9}^{\circ} \text{R}.$$

$$(23) 9^{\circ} \text{F} : (22^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{-10 \times 5}{9} = -\frac{50}{9}^{\circ} = -5\frac{5}{9}^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (22^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{-10 \times 4}{9} = -\frac{40}{9}^{\circ} = -4\frac{4}{9}^{\circ} \text{R}.$$

$$(24) 9^{\circ} \text{F} : (31^{\circ} \text{F} - 32^{\circ} \text{F}) :: 5^{\circ} \text{C} : \frac{-1 \times 5}{9} = -\frac{5}{9}^{\circ} \text{C}.$$

$$9^{\circ} \text{F} : (31^{\circ} \text{F} - 32^{\circ} \text{F}) :: 4^{\circ} \text{R} : \frac{-1 \times 4}{9} = -\frac{4}{9}^{\circ} \text{R}.$$

$$(25) 5^{\circ} \text{C} : -12^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{-12 \times 9}{5} = -\frac{108}{5}^{\circ} = -21.6^{\circ} \text{F} + 32^{\circ} \text{F} \\ = 10.4^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : -12^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{-12 \times 4}{5} = -\frac{48}{5}^{\circ} = -9.6^{\circ} \text{R}.$$

$$3) \ 5^{\circ} \text{C} : -22^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{-22 \times 9}{5} = -\frac{198}{5}^{\circ} = -39.6^{\circ} \text{F} + 32^{\circ} \text{F} \\ = -7.6^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : -22^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{-22 \times 4}{5} = -\frac{88}{5}^{\circ} = -17.6^{\circ} \text{R}.$$

$$7) \ 5^{\circ} \text{C} : -31^{\circ} \text{C} :: 9^{\circ} \text{F} : \frac{-31 \times 9}{5} = -\frac{279}{5}^{\circ} = -55.8^{\circ} \text{F} + 32^{\circ} \text{F} \\ = -23.8^{\circ} \text{F}.$$

$$5^{\circ} \text{C} : -31^{\circ} \text{C} :: 4^{\circ} \text{R} : \frac{-31 \times 4}{5} = -24.8^{\circ} \text{R}.$$

$$8) \ 4^{\circ} \text{R} : -8^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{-8 \times 5}{4} = -10^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : -8^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{-8 \times 9}{4} = -18^{\circ} \text{F} + 32^{\circ} \text{F} = 14^{\circ} \text{F}.$$

$$9) \ 4^{\circ} \text{R} : -12^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{-12 \times 5}{4} = -15^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : -12^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{-12 \times 9}{4} = -27^{\circ} \text{F} + 32^{\circ} \text{F} = 5^{\circ} \text{F}.$$

$$0) \ 4^{\circ} \text{R} : -20^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{-20 \times 5}{4} = -25^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : -20^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{-20 \times 9}{4} = -45^{\circ} \text{F} + 32^{\circ} \text{F} = -13^{\circ} \text{F}.$$

$$1) \ 4^{\circ} \text{R} : -28^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{-28 \times 5}{4} = -35^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : -28^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{-28 \times 9}{4} = -63^{\circ} \text{F} + 32^{\circ} \text{F} = -31^{\circ} \text{F}.$$

$$2) \ 4^{\circ} \text{R} : -32^{\circ} \text{R} :: 5^{\circ} \text{C} : \frac{-32 \times 5}{4} = -40^{\circ} \text{C}.$$

$$4^{\circ} \text{R} : -32^{\circ} \text{R} :: 9^{\circ} \text{F} : \frac{-32 \times 9}{4} = -72^{\circ} \text{F} + 32^{\circ} \text{F} = -40^{\circ} \text{F}.$$

EXERCISE LXXXV., p. 187.

$$1) \quad \begin{array}{r} 8) \ 6734 \\ 8) \ 841 \ . \ 6 \\ 8) \ 105 \ . \ 1 \\ 8) \ 13 \ . \ 1 \\ \quad 1 \ . \ 5 \\ \hline 15116. \end{array}$$

(2) $6) 1543$

$6) 257 . 1$

$6) 42 . 5$

$6) 7 . 0$

$1 . 1$

11051.

$6) 12345$

$6) 2057 . 3$

$6) 342 . 5$

$6) 57 . 0$

$6) 9 . 3$

$1 . 3$

133053.

(3) $7) 12223$

$7) 1541 . 5$

$7) 205 . 2$

$7) 25 . 6$

$3 . 2$

32625.

$7) 230316$

$7) 30040 . 6$

$7) 3770 . 0$

$7) 486 . 3$

$7) 63 . 3$

$7) 8 . 1$

$1 . 1$

1113306.

(4)

$8) 342$

$8) 24 . 6$

$2 . 0$

206.

(5) $12) 43289$

$12) 3607 . 5$

$12) 300 . 7$

$12) 25 . 0$

$2 . 1$

21075.

$12) 3487$

$12) 290 . 7$

$12) 24 . 2$

$2 . 0$

2027.

(6) $e) 12345$

$e) 1122 . 3$

$e) 102 . 0$

$9 . 3$

9303.

$e) 8743$

$e) 794 . 9$

$e) 72 . 2$

$6 . 6$

6629.

(7) $e) 8005$	$e) 88888$
$\underline{e) 648} . 7$	$\underline{e) 7824} . 0$
$\underline{e) 53} . 2$	$\underline{e) 602} . 0$
$\underline{4} . 4$	$\underline{e) 48} . 4$
4427.	$\underline{4} . 0$
	40400.
(8) 2378	33002
3426	<u>32103</u>
6843	233
<u>8783</u>	
11209	
(9) $12) 8000$	$12) 9999$
$\underline{12) 737} . 4$	$\underline{12) 909} . 0$
$\underline{12) 67} . e$	$\underline{12) 83} . 6$
$\underline{6} . 1$	$\underline{7} . 7$
61e4.	7760.
(10)	$e) 5t4e8$
	$\underline{e) 6499} . 5$
	$\underline{e) 6e9} . 6$
	$\underline{e) 77} . 4$
	$\underline{8} . 3$
	83465.
(11) 56432	43289
<u>234</u>	<u>564</u>
325361	150te0
235626	217446
<u>146164</u>	<u>194179</u>
20634351	1e721050
(12) 178432	(13) 35|16|44 (532
<u>156888</u>	<u>31</u>
21433	$\underline{123) 416}$
	<u>371</u>
	1262) 2544
	<u>2544</u>

(14) 6) 1054	6) 345	2324
6) 134 . 4	6) 46 . 1	621
6) 17 . 2	6 . 2	2324
2 . 3	621.	4648
2324.		12832
		132094

(15) 132) 2100043 (11234	4e) 6e8134e (80561
132	6e34
230	4934
132	4407
430	5334
314	5256
1114	4e
1001	4e
1133	...
1133	
....	

(16) 48	e5) 94734 (48
e5	962
43e4	453
9634	398
94734	774
	774
	...

(17) 23) 4336 (178	178
23	74e
203	1604
173	1448
206	e58
206	10e684
...	

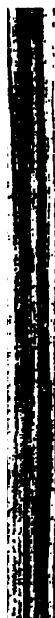
8) 6) 10000209
6) 1666701 . 3
6) 277783 . 3
6) 46297 . 1
6) 7716 . 1
3) 1286 . 0
6) 214 . 2
6) 35 . 4
5 . 5
554201133.

578432
49t46 t
88t73

9) 14|5t|45 (3t4
9
6t) 65t
631
794) 2945
2945
....

1) 12) tt784	12) t49t7
12) t071 . 3	12) 9537 . 0
12) 924 . 8	12) 886 . 1
12) 84 . e	12) 80 . 6
7 . 8	7 . 4
78e83.	74610.

THE END.



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